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VIEWS, NEWS AND INTERVIEWS.

An electrician, whose residence adjoins a church, was asked recently if he had heard the sermon preached on a previous Sunday. "Only by induction," he replied; "and the retardation due to the walls of my house seriously affected the passage of the sermon."

Col. Henry C. Davis, ex-president of the Electric Club, of this city, is an enthusiastic philatelist.

Sockless Jerry Simpson, the new Kansas Congressman, is in favor of government control of telegraphs, and will probably be heard from when he gets the floor.

On one of the corners at Broadway and Twenty-seventh street, a mail box is attached to a lamp-post standing close to an arc light pole. On a recent rainy evening a mail carrier slowly approached the box and, glancing up at the arc light, timidly put forth his hand and allowed the tips of his fingers to touch the box, all the while keeping his eyes on the light. No unusual effects taking place, he hastily relieved the box of its contents and hurried away, casting a backward glance at the light, which sputtered gleefully at him.

Speaking of inventors and their vagaries, a bright man remarked: "There is a great difference between prediction and production."

De Rennslaer is an engineer in the service of one of the large electric companies. He can't spell a great many simple words. One day recently he was hard at work at his desk and was seen to meditatively chew the end of his pen. Finally, he called across the room to one of his assistants:

"Hodgekins, how do you spell 'exhibit?'"

"E-x-h-i-b-i-t."

"Thank you, Hodgekins." Then more writing for a short spell.

"Hodgekins, how do you spell 'current?'"

"C-u-r-r-e-n-t."

"Thank you, Hodgekins."

This dialogue was repeated numerous times with variations. At last, De Rennslaer said:

"Hodgekins, please come and stand by my desk; I am writing a letter."

When such a man as the Hon. Thomas Brackett Reed says that "advertising is the absolute prerequisite to the sale of goods," it must be so. Every newspaper man agrees with Mr. Reed, and so do all successful men generally.

Ex-Gov. Henry W. Ladd, who made many friends among electrical people at the Providence Convention of the National Electric Light Association, has been renominated for the governorship of Rhode Island by the Republican party.

The *Commercial Gazette*, Cincinnati, evinces its good judgment in copying extensively from the columns of the ELECTRICAL REVIEW. It could, also, give evidence of its honesty by giving proper credit.

A Discontented Correspondent.

The REVIEW has a correspondent in South America; of course, it has many in that region of the world, but this particular correspondent is perhaps of all of them the most original and refreshing in the demands, or rather requests, that he makes of the REVIEW. The gentleman in question, who rejoices in the name of Don Manuel F. Garcia L., wrote us some time since conveying the information that the REVIEW, whose fame and circulation are world-wide, had penetrated to his native place, the town of Magangué, in the United States of Colombia. The enlightened hidalgo read his copy of the REVIEW and became enraptured over the fund of information contained in its pages; so *enthusiasmado* was he, that he felt at once that his compatriots would jump at the opportunity of acquiring the great quantity of electrical knowledge that can be obtained for the price of a subscription to the REVIEW and by the diligent study of its weekly issues.

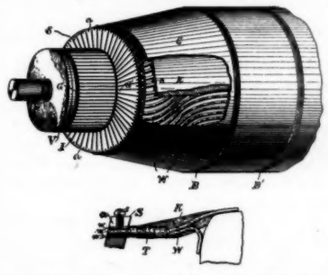
Imbued with this idea, Don Manuel sat himself down and indited a letter in his native tongue to the publishers of this journal, pointing out the opportunities that he commanded of electrifying the natives of Magangué and offering his services as representative of the REVIEW in that important South American city. To this we replied in our choicest Castilian, approving heartily of the good señor's efforts on behalf of what he is gracious enough to call our "*ilustrado periódico*," and offering him our most favorable terms in a business way.

On the strength of this correspondence we had been building up hopes of extending widely the electrical interests of North America throughout the width and breadth of Colombia, by the dissemination of our writings over that republic, when our expectations were suddenly dashed to the ground by the receipt of another letter from Don Manuel. In this latter communication, our correspondent suavely informs us that would-be subscribers to the REVIEW are deterred from becoming so actually by reason of the unfortunate, but important feature, that the paper is written in English! They all concur with Don Manuel in declaring that our *ilustrado periódico* is "the best of all of its class," and if it were only written in Spanish a large number of subscribers would immediately be added to our books. But unhappily the pure English which graces our columns is an insurmountable obstacle to the enjoyment of them by the natives of Magangué, who are so anxious to read, mark, learn and inwardly digest electrical articles and electrical news.

We regret to say that at present we see no way out of the difficulty. We are scarcely prepared just now to undertake the issuance of a Spanish edition of the REVIEW, as el Señor Garcia delicately suggests that we might. Perhaps some day we may come to that. There is a large field for the electrical industries to the South of us, and we are inclined to think that an electrical paper, published in Spanish, and emanating from New York, the heart and center of electrical progress in all branches of the industry, would command a large circulation throughout Central and South America, and would be a powerful agent in developing trade in electrical apparatus and supplies between the United States and the numerous republics of South America.

Commutator Connections for Motors and Generators.

In running dynamo-electric machines and motors, and especially motors for street railway service, the armature wires, where they are led out to the commutator segments, are frequently broken by reason of the great jars and shocks to which the motor is subjected, which cause more or less independent motion between the commutator and armature, thereby producing a brittleness in the copper and eventually rupturing the wires. A device has recently been patented by Elihu Thomson for overcoming this difficulty, which consists in enclosing the wires leading from the armature coils to the commutator bars in a mass of insulating and non-heat conducting material. The device is illustrated in the accompanying engraving, where it will be noted that the wires are all



bound together in one fairly rigid whole by a filling of a composition, K, made up of paper pulp and glue or other similar agglomerant. Before applying this filling, the wires are secured together by a wrapping of tape, as indicated at T. To prevent damage from moisture, the composition may be coated with varnish and then covered by a waterproof shield, G, around which are the bands, B B^1, for binding the body of the armature together. At the point where the wires are secured together to the commutator segments, a third steel wire, w^1, is inserted between the wires, w w^2, to add greater rigidity to the connection, and the three wires are inserted in a slot formed in the commutator segment, and secured by a screw, s, engaging the side walls of the slot.

The Western Union.

Mr. J. Angus has brought a curious suit against the Western Union Telegraph Company. The company formerly had an office in Mr. Angus' hotel at Pike Lake, Wis., and when the instruments were removed he claims the wires were not disconnected. Last Summer Mr. Angus received a stroke of lightning which is claimed to have been transmitted to his house by these wires. Case was decided against Mr. Angus.

The directors of the Western Union Telegraph Company, on March 11, declared the regular quarterly dividend of 1¼ per cent., payable April 15. The net earnings for quarter ending March 31, partly estimated, show a decrease in net revenue of $50,000, mostly attributed to the loss by fire and the damage to wires incurred by the heavy storm in January. The surplus April 1 will show, as estimated and actual, $11,321,137, as against $9,594,956 in 1890, or an increase of $1,726,181.

Arrests on Telegrams.

The recent trouble between Governor Hill, of New York, and Governor Bulkely, of Connecticut, over the extradition of criminals from New York to Connecticut, has led to the introduction of a bill in the New York legislature by Senator Ives which provides for important amendments of the law governing extradition between States. The present law requires that reasonable proof of guilt shall be produced before extradition is granted. This is held to be entirely impracticable, as all that is necessary and all that most States require is proof that the fugitive is legally charged with the crime, by indictment or otherwise.

The new bill provides that the arrest of a fugitive from justice shall be legal upon the receipt of a telegraphic notification from the governor of another State, and on the strength of such notification any magistrate may issue a warrant, and may remand the prisoner for such time as may be necessary to permit the arrival by mail or otherwise of the papers in the case. It is further provided that proof of the legal charge being brought, and not of guilt, shall be sufficient.

Sold Telephones in Sections.

An ingenious point of patent law was raised before Judge Blodgett in Chicago last week in a motion by Arthur F. Arnold to dissolve an injunction obtained by the Bell Telephone Company restraining the manufacture of telephones infringing on the Bell patents. Arnold is an electrician and advertised that he would sell the parts necessary to make a telephone for less than the rental of a Bell telephone for a year. Arnold did not send out any complete instruments, but sold the parts necessary to make them. It was argued by Attorney J. Warren Peese that none of these separate parts constituted an infringement and if any was perpetrated it was by the purchasers who put them together and used the telephones. Judge Blodgett decided differently, however, and continued the injunction.

One End of a Cable Taxed.

The president of the Bell Telephone Company, of Montreal, Canada, recently inquired of the Secretary of the Treasury if the end of the telephone cable which is to be passed through the tunnel connecting Sarnia with Port Huron, Mich., would be admitted to entry free of duty. Assistant Secretary Spaulding has informed him that so much of the cable as may be brought within the limits of the United States would be subject to duty under existing laws, the department having no authority to waive the same.

To Reduce Telephone Rates in New York.

Early in the present session of the New York Legislature, Assemblyman Roche introduced a bill which provides that telephone companies must furnish service to all persons within their districts applying for the same, in cities of more than 500,000 inhabitants, at the rate of $75 per year. A higher price may be charged where an exclusive wire is furnished. The friends of the measure affirm that the bill will be favorably reported within a few days, and that a canvass of the Assembly shows that it will pass that body.

Rapid Transit Between Cities.

A DIGEST OF THE DISCUSSION FOLLOWING THE READING OF MR. O. T. CROSBY'S PAPER BEFORE THE INSTITUTE OF ELECTRICAL ENGINEERS, ON "RAPID TRANSIT AT 120 MILES AN HOUR."

In reply to an inquiry, it was stated by Mr. Crosby that the stopping space with a braking power that would just fail to slide the wheels at a speed of 120 miles an hour would be about 7,000 feet, and that the distance of getting the train to speed with the motors as designed would be, perhaps, two or three miles. He gave it as his opinion that such high speeds were only valuable for very long distances and were not practicable for distances of 40 miles or so, and that, therefore, his system would be only commercially practicable in connecting large cities.

Mr. F. L. Pope mentioned an opinion expressed by an eminent civil engineer that safety from derailment at very high speeds would be best secured by very slightly curving the line of the road just sufficiently to cause the flanges of the wheels to bear constantly against one side, with which construction a speed of 200 miles an hour would be perfectly safe.

Mr. Thomas D. Lockwood stated that his experience led to the conviction that the highest speed he had ever known was done on trains where the stations were very close together. On long runs a fairly high average can be attained; but with way trains, where stations are very frequent, enormously high speeds between stations must sometimes be attained to keep within the time schedule. He mentioned, further, a marvelous incident of rapid transit on the Housatonic Railroad between Pittsfield, Mass., and Canaan, Conn., where there are a large number of stations, in which a train was known to have left Pittsfield some 50 or 60 minutes behind time and yet reached its destination on time. Referring to the subject of increased traction, he commented unfavorably on the claims put forward to the increased tractive effect provided by the passage of a current between the wheels of a train and the rails. He thought that unless the current was sufficiently heavy to form a slight weld between the wheels and the rail that the effect would be insignificant, and that if a current sufficiently heavy to produce such weld were used that the adhesive resistance of the weld to rolling motion would counterbalance the advantage gained by increase of traction.

Mr. Crosby stated that he had a very decided opinion against the advantage of such a method of increasing traction, stating that he knew of unpublished experiments which indicated that a three or four pound model took something like 200 amperes to produce any effect and that with plainly a welding effect, since it showed a clear pitting of the rail on which the model ran. Such an amperage with such a model indicated that the amount of current needed for practical purposes would be so great as to render the subject impossible of consideration. Referring to the utilization of the energy of the train in stopping or going down grades by means of operating the motors as generators and sending current back into the line, he thought that where the stops were numerous, as on the elevated roads of New York city, something might be gained by such an arrangement. In this case the motors would normally have to work below the saturation point, so that the electro-motive force of the motors acting as generators would be sufficiently high to pump back into the line. Replying to a question put as to package transportation and automatic service, he believed that any style of service must needs be safe enough to carry an engineer. The complexity of an automatic system that would take care of entrance into and departure from a city and all of the varying conditions of service without a man on board was beyond the pale of practicability.

By request, Dr. P. H. Dudley discussed the subject, with a view to resistance to motion and condition of the track. He found on the Lake Shore and Michigan Southern Railroad and the New York Central and Hudson River Railroad that, with trains of about 230 tons, the resistance was only from 10 to 12 pounds per ton at speeds of from 50 to 60 miles per hour, in lieu of the resistance of 17 or 18 pounds per ton as given by the text-book formulæ. The resistance per ton is not nearly so great on long trains as on short ones. With trains of two and three cars, sometimes it ran as high as 35 or 40 pounds per ton, but with long trains it ran down to about 10 or 12 pounds per ton. The greatest variable is the wind resistance, and an experiment made in 1878, to see why the New York Central was not able to make its time with its trains, showed that on a still day it was possible to make time, but a wind of 10 or 12 miles an hour would retard the trains so that, in running from Buffalo to New York, they would lose two hours. The trouble at that time was that the boilers were not large enough to quickly generate the steam required to meet the increased resistance. Trains were run up to a speed just about the capacity of the boiler, and that would limit the speed they could maintain; therefore, when a head or steady wind was blowing against them, the speed would be reduced very materially. The greatest improvement in decreasing train resistance is in bringing up the standard of excellence of the track and adopting heavier and stiffer rails. The method of making rails adopted in his own practice was to make them very stiff, and thus reduce the deflection or wave motion under each of the wheels. Comparing the resistance of the Chicago Limited Express on stiff 80 pound rails, with that of the 65 pound rails which have been on the track some time, it makes a difference of 75 to 100 horse-power per mile. With stiff rails, the line is so perfect that there is scarcely any oscillation on the best roads, and there is now very little difference in the oscillation in riding on a tangent or a curve. He thought that in the case of some 105 pound rails which he had designed he would be able to save on the fast express trains nearly 200 horse-power per mile, as compared with worn 60 or 65 pound rails. He thought it would be perfectly safe to run at a speed of 120 miles an hour on a track made up of 105 pound rails. He had ridden several times 75 miles an hour on heavy rails and did not feel it nearly so much as when running 45 miles an hour on light rails. There is scarcely any oscillation, the track is in perfect line, and the joints are all kept up. He illustrated on the blackboard the shape of worn rails found in tracks, which are illustrated in the accompanying engravings. Fig. 1 illustrates the condition of a perfect track with 65 pound rails. After they have been run over a little while, the rail is worn and bent into the form shown in Fig. 2, down at the joints and high in the center. As the locomotive or train passes over the depression the wheels strike on the receiving end of the rail and cut out a piece from its head; sometimes the effect is sufficient to bend the rail down at this point. There is more advantage in making the rail very stiff in section than merely increasing the weight. In his design of rails he makes the heads very much broader and the sections stiff, so that the deflection in the 75 or 80 pound rail is less than $\frac{1}{10}$ of an inch in the track. Another defect developed in practice is where the joints and center are both low and the rail is high at the quarters; this form is illustrated in Fig. 3. Then there is another form in which the surface is all full of waves, as illustrated in Fig. 4. With old tracks having these irregularities a large amount of force is lost. The mode used to detect the irregularities is a device carried on a car, which ejects paint on the rails wherever there is a definite deflection. The apparatus is so reliable in its action and the weaknesses of wear so uniformly developed, that it is possible to tell from the diagrams in the car while moving over the rails what mill made them.

Mr. Frank J. Sprague, commenting on the suggested possibility of returning energy of the train to the line, agreed with Mr. Crosby that where the stops were numerous, as on the elevated railway service, the importance of returning the energy becomes very great, stating that from calculations he had made he found it possible to return about 40 per cent. of the total energy used back to the line by using shunt machines and exciting the field magnets up to a very high saturation. He thought that the criticism that there would be a loss in energy of the field magnets more than in the case of series machines would not hold good, for the reason that the total energy used in the field magnets formed a very small proportion of the total amount of energy used on the line, and if the return energy was 40 per cent. of the total the value of such a method becomes apparent.

Mr. Crosby added a few remarks as to the friction co-efficient. He found that the dynamometer on an ordinary flat rail showed about 25 pounds average per ton for a car weighing about 12,000 pounds, that is, a street car on an average street car track. He started a car equipped with an ordinary Sprague motor, with 14 amperes, by having a water resistance external to the car. Speaking of the relative advantages of steam and electric traction in view of possible improvements, he thought electricity had decidedly the advantage for passenger traffic, and steam for freight traffic. For high speeds electricity must lead steam, for the reason that the accumulative load in using steam, the coal necessary to be carried and the water, makes the greater economy lie with electricity. If you can get 90 per cent. efficiency out of your electric service, and have a frequent service at 20 miles an hour, electric propulsion is slightly more economical than steam propulsion. As the speed is increased the relative value of the electric propulsion increases enormously, and at 120 miles an hour it is something like six times more economical than steam. Such a speed for any length of time would be out of the question with steam, because the amount of coal and water required to be carried adds a quantity that would require two or three tenders to take care of. Every pound of coal added requires more coal to be burned to pull that pound.

FIG. 1.

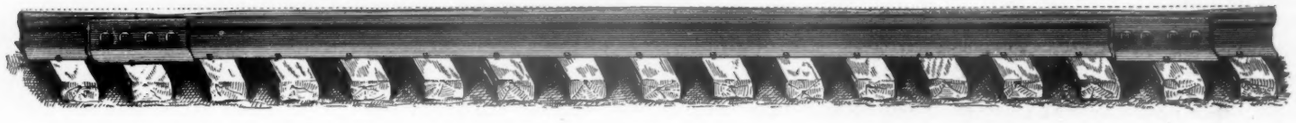


FIG. 2.

FIG. 3.

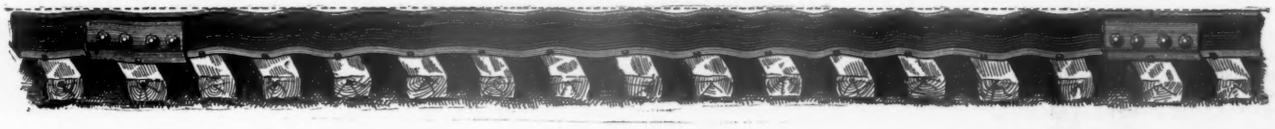


FIG. 4.

OUR LONDON LETTER.

Death of Otto.—From Cologne is announced the death of Herr Otto, the inventor of the celebrated gas engine of that name.

The Central London Railway.—The Duke of Westminster, with the assumption, no doubt, that his property might be depreciated in value, has presented a petition against this bill in the House of Commons.

Sir Frederic Abel, C. B.—The Queen has ordered the promotion of Sir F. Abel, C.B., the president of the committee of explosives, war department, to the dignity of a Knight Commander of the Order of the Bath (civil division).

International Machinery Exhibition for Engineers, Electricians, Etc.—The third yearly exhibition is to be held at the Royal Agricultural Hall, from April 23 to May 2. Applications for space must be addressed to Mr. H. Hetherington, 42 New Oxford Street, W.

The Royal Naval Exhibition, 1891.—In regard to the working of electric models on the water-basin at this forthcoming exhibition, some valuable suggestions have been made by Captain Wilson, V. C., of Her Majesty's ship "Vernon," which will greatly increase the interest to visitors.

St. Martin's Free Library.—This library, which was opened on Thursday by Mr. Gladstone, is lighted by the electric light. It is situated in the London Electric Company's district, but until they are in a position to supply current, the Metropolitan Company have undertaken to do so.

Electric Lighting of the St. James' Theatre.—This theatre, to which Mr. George Alexander has removed "Sunlight and Shadow" from the Avenue Theatre, is now lighted by electricity. Messrs. Rashleigh, Phipps and Dawson, of Berners street, W., completed the installation in four weeks.

This Year's German Exhibition.—The contract for the whole of the electric lighting of this exhibition at Earl's Court has been obtained by the Gülcher (New) Electric Light Company, of Battersea, who have so successfully carried out the lighting of the buildings and grounds in the exhibitions of the last two years.

Brighton Grand Hotel.—At the general meeting of this company, held last Wednesday, the chairman announced the completion of their own electric lighting installation at a cost of about £6,000, which, calculated at five per cent., meant £300 a year, instead of the £2,000 a year they had been paying the electric light company.

Spiritualistic Seances.—The electric scarf pin has done a public service in exposing the tricks of professional mediums. At a séance given in Lamb's Conduit street, where direct manifestations in the shape of spirit faces were brought before those assembled, the result of the sudden production of the clear electric light was the discovery of the medium in spirit draperies and holding up a luminous slate.

Messrs. Barraclough & Company, Limited.—Messrs. T. Barraclough & Company, of Manchester, the well-known makers of wire covering machinery, have opened offices at 20 Bucklersbury, London, E. C., and Mr. Barraclough, who has had 25 years' experience in the fitting up of industrial establishments, is prepared to advise purchasers of machinery, or to furnish plans and estimates for any kind of factory, including electric lighting plant and every requisite.

The City and South London Subway.—Arrangements are now being made for the construction of additional sidings at Stockwell, the present accommodation having been found quite insufficient. At the Stockwell depot, on the Board of Trade recommendation, a fourth engine and dynamo are to be added to the generating plant, and the rolling stock is to be increased by the addition of four locomotives and two trains, which will permit an increase in the number of trains run each day, and if considered desirable, the opening of the line on Sundays.

Dublin.—The tenders of the Electrical Engineering Company of Ireland, and of the Irish House to House Electricity Company, have been accepted by the Dublin Corporation, the contract being made with the Electrical Engineering Company of Ireland, on the assurance that it would be carried out with the assistance of the Irish House to House Company. It is likely that the incandescent lighting portion of the contract will be carried out in accordance with the plans submitted by the Irish House to House Company, and the arc lighting on the lines submitted by the Electrical Engineering Company of Ireland.

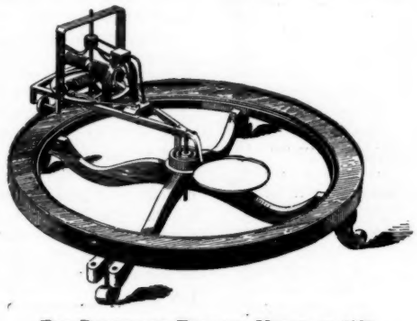
The City of London Electric Lighting (Pioneer) Company, Limited.—With this lengthy title and a capital of £100,000, in £50 shares, the above company was launched this week to take up and work the contracts for the lighting of the city. The board of directors is a strong one, the Right Honorable Alderman Joseph Savory, Lord Mayor of London, is the chairman, and among others are His Grace the Duke of Marlborough, who is chairman of the Electric and General Investment Company, Limited, the Earl of Suffolk and Berkshire and J. Bevan Braithwaite, Jr., Esq., director of the Electric and General Investment Company; Major-General Webber, C. B., is the consulting engineer, and, from what I can hear, the shares have been more than fully subscribed for.

The London Electric Supply Company.—Since the late fire at the Grosvenor Gallery distributing station, there has been a refitting of transformers, and the current is now received for distribution from Deptford, at the full pressure of 10,000 volts, along 16 miles of mains. The supply at present is not continuous, being only between 4 P. M. and 2 A. M., and a few customers have been taken on each day, the earlier being somewhat diffident as to the result of a connection with a system working at such an enormous pressure, but when the lamps showed the usual steady light of 100 volts, other customers followed freely. Before starting, there was a thorough trial test on open circuit, the mains and transformers being subjected to 18,000 volts. Instead of the overhead circuits which are to be no longer used, Siemens and Fowler-Waring concentric sheathed cables are employed. The supply has shown a perfectly successful week's working, and the progress of the distribution of electric light from a considerable distance will be watched with the greatest interest by electrical engineers, the gas companies and others.

The Electrical Standardizing, Testing and Training Institution Conversazione.—A most pleasant conversazione was given February 9th, by Mr. and Mrs. Robert Hammond in connection with the above institution, at the new premises at Faraday House, Charing Cross Road. Among the 500 visitors present were the Attorney-General, Lord and Lady Castletown, Lord Gifford, V. C., Sir Henry Mance, Professors Reimold, Geo. Forbes, Crothers, Foster and Bently, Sir Henry and Lady Cartwright, Mr. and Mrs. de Ferranti, Sir Phillip Rose, Mr. Spagnoletti, Lord Russell, Mr. Gisbert Kapp, Mr. and Mrs. Preece and Dr. Robson Roose. In addition to an interesting electrical exhibition, there was a good musical programme provided. Mr. Langdon-Davies' phonapore in actual working order was the great point of interest to visitors, the exhibit rooms being almost as crowded as the sumptuously provided refreshment rooms, duplex messages in opposite directions being continuously despatched along a wire already in use for Morse instruments, the small current induced being sufficient to vibrate a strained steel reed acting as relay switch for special telegraphic instruments, but in no way affecting the ordinary instruments. For those desiring a practical test, messages in Morse letters were sent in threes and simultaneously. The Post Office showed telegraphic apparatus, Messrs. S. Z. de Ferranti & Company and the House to House Electric Supply Company exhibited transformers, meters and fittings of their respective systems, and Messrs. Elliott Bros. had very interesting exhibits of Willis' electric ship signaling apparatus with Spratt's electric speed indicator and Granville's new electric log, dispensing with insulation on the tow-line or use of battery. The institution has been formed to carry on the work of the old Hammond College, which was discontinued some years ago, and is under the direction of Mr. H. E. Harrison, B. Sc. Faraday House is a fine building and is provided with a number of laboratories, lecture rooms, workshops, etc.

Electric Lighting of the City of London.—The foundation stone at the main junction connecting the conductors to be laid down by the two contracting companies, the Brush Electrical Engineering and the Laing, Wharton and Down Construction Syndicate, was laid last week by the Lord Mayor in Walbrook, E. C. A large company was present and an explanatory statement of the work to be carried out was made at a luncheon following the ceremony at Cannon Street Hotel. The toast "The Electric Lighting of the City of London" was proposed by the Duke of Marlborough, and was coupled with the name of Mr. Preece, who in reply stated his conviction that in the event of the contracts being carried out as he thought they would be, London would become the best lighted city in the world. A few particulars of what is to be done may be found interesting. The Commissioners of Sewers have concluded two contracts, the one with the Brush Electrical Engineering Corporation, Ld., for the central and western divisions, and the other with the Laing, Wharton and Down Construction Syndicate for the eastern division. The streets are to be wholly lighted by electric light, partly by arc and partly by incandescent lamps. Of arcs there will be 400 of 2,000 candle-power, and 1,000 incandescent lamps, absorbing from 100 to 200 watts per lamp. The whole cost will exceed £20,000 per annum, and the two companies, who will have practically a monopoly of private supply, have already applied to Parliament for provisional orders, and which have already been granted for the supplying of electricity to private consumers in the central and eastern divisions. The Laing, Wharton & Down generating station for the eastern division will be situated on the river bank between the Custom House and the Tower, and a plant has been designed specially with an ultimate capacity of 600 2,000 candle power arc lamps, and 120,000 eight candle-power incandescent lamps, and using Thomson-Houston apparatus throughout. The Brush Electrical Engineering Company's station is on the south side of the river, and the mains will cross by the Southwark and Blackfriars Bridges. The ultimate capacity of this station will be 600 2,000 candle-power arc lamps, and 120,000 eight candle-power incandescent lamps. CHARLES FFRENCH.

London, February 28, 1891.



THE DAVENPORT ELECTRIC MOTOR OF 1835.

Thomson-Houston Standardizing Bureau.

A standardizing bureau has been formed among the different factories of the Thomson-Houston system. The members are Messrs. Dalzell, of the Schuyler Electric Company; Phipps, of the Brush Company; Talbot, of the Fort Wayne Company; Randall, of the Excelsior Company; H. S. Manning, of the Chicago office; Rohrer and Ekstrom, of the Lynn factories, and Lovejoy, of the Boston office. It is standardizing all the various parts in the various factories, meters, cut-outs, switches, switchboards, lightning arresters, etc.

Edison General Electric Company.

The announcement that the Vanderbilts have secured an additional interest in the Edison Company has called the attention of people to these securities. A gentleman in position to know the facts says that the Vanderbilts have been quietly investigating the electric plants for a couple of years. They are satisfied that they are paying investment properties, and are putting money into them as they would into any investment enterprise. The Edison Company last year earned $2,000,000 on a capital of $20,000,000, and this is looked upon as especially encouraging.—*Boston News Bureau.*

Spokane Falls, Wash.—Spokane and University Heights Street Railway Company, of Spokane Falls, Wash., has been incorporated, and will construct and equip six miles of electric road in the Spring. The officers of the corporation are Allan V. Garratt, president and general manager; Robert Abernethy, vice-president, and C. B. Cornell, secretary.

Worcester, Mass.—S. Winslow, T. M. Rogers, E. L. Watson, W. F. Whittemore, C. N. Prouty, W. B. Thompson and T. T. Robinson, directors; T. T. Robinson, clerk and treasurer, have organized as the Worcester, Leicester and Spencer Street Railway Company, to construct a road from near Worcester Common through Leicester to a point near the Spencer town hall, about 13 miles, which is to be operated by any motive power except steam; capital, $250,000.

Athol, Mass.—Athol Gas and Electric Company; capital, $25,000.

Boston, Mass.—Providence Telephone Company; capital, $10,000.

Baltimore, Md.—The Zell Stored Power Company; capital, $500,000.

Tacoma, Wash.—Wheless Underground Electric Company; capital, $500,000.

LaGrange, Ky.—LaGrange Electric Light and Power Company; capital, $15,000.

Darlington, S. C.—Darlington Light, Water and Power Company; capital, $25,000.

Birmingham, Ala.—The People's Electric Light and Gas Company; capital, $100,000.

Collingswood, Pa.—The Collingswood Water and Light Company; capital, $25,000.

Hillsboro, O.—Hillsboro Electric Light, Water and Power Company; capital, $10,000.

Cleveland, O.—People's Electric Company, to furnish electric light and power; capital, $10,000.

Newark, N. J.—New Arc Mining Company, to mine coal by electric machines; capital, $1,000,000.

Chicago, Ill.—United States Trading Company; to deal in railway and electrical appliances; capital, $100,000.

Elgin, Ill.—The Elgin Electric Company; capital, $10,000; for the manufacture of dynamos, motors and electric appliances.

Denver, Colo.—The Denver Highlands Electric Company; capital, $500,000; to furnish electricity for heat, light and power.

St. Louis, Mo.—St. Louis Underground Service Company, to construct and operate subways for electrical purposes; capital, $1,000,000.

Keeseville, N. Y.—The Keeseville Electric Light and Power Company; capital, $40,000. Trustees are Wm. D. Rich, Henry R. Gardner and Hiram C. Hill, all of Greenwich.

St. Louis, Mo.—The Moberly Gas and Electric Company, with $30,000 capital and L. M. Rumsey, James Green, George A. Medill and Francis A. Baumgardner, as stockholders.

Chicago, Ill.—Hallings Electrical Construction and Interior Conduit Company; capital, $50,000; for electrical construction. Incorporators, Thomas Hallings, R. L. Stephens, Emilie J. Boileau.

Chicago, Ill.—Electrical Expert Company, to manufacture electrical and other machinery and perform electrical engineering; capital, $25,000. Incorporators, Henry M. Wolf, Frederick G. O'Connell and Arthur A. Bliss.

Monmouth, Ill.—Monmouth Motor Street Railway Company; capital, $30,000; to construct and operate a railway in streets and alleys in Monmouth for the transportation of passengers, baggage, freight, fuel, mails, and to furnish light and heat. Incorporators: J. E. Foster, J. W. Foster, G. W. Foster.

Anna, Ill.—Anna and Jonesboro Electric Street Railway and Power Company, to furnish power and light and operate a street railway; capital, $20,000. Incorporators, F. S. Dodds, C. L. Ostrich, J. E. Lufkin, R. B. Stinson, A. D. Finch and W. Henderson.

Tucson, Ariz.—The Tucson Improvement Company has been organized with the purpose of digging artesian wells, purchasing lands, erecting blocks, constructing street railways and furnishing light and power by electricity. The capital stock stock is $500,000, principally subscribed in England.

Cottage City, Mass.—Cottage City Street Railway Company; capital, $15,000. The directors are W. H. Phillips, of Taunton, W. C. Van Derlif, of Boston, Charles B. Dennis, E. G. Eldridge, A. G. Wesley, Hamilton J. Greene, John L. Mayhew, of Cottage City. E. G. Eldridge is president and H. J. Greene treasurer.

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The interview with Mr. Geo. W. Davenport concerning electric lighting in Berlin, which appeared originally in the REVIEW, has been widely quoted and seldom with proper credit. The Cincinnati *Commercial Gazette* led off, and then the New York *World* quoted it from that journal. We beg to announce to these esteemed purloiners that the statement made by Mr. Davenport referred to Hamburg and not to Berlin. We trust they will publish the correction—and give credit.

Every central station man throughout the country should interest himself in the present suit of the electric lighting companies of New York against the city. This interest should include pecuniary aid, if necessary. It is all important that the city be worsted in this fight. The decision, whatever it may be, will be quoted among the authorities on the subject. There never was a claim more just than this, and providing the political pull of the defendants is not strong enough to drag the bandage from the eyes of justice, the electric light companies will win. In an impartial trial, any other verdict than one for the full amount of damages claimed, is impossible. It is well known to many of us that much of the wire condemned and cut down by Mayor Grant is in use on overhead circuits in other cities and giving perfect service.

In the discussion over Mr. O. T. Crosby's paper on "Rapid Transit," the idea that any increased tractive effect results from a current passing between the wheels of a car and the rails was quite generally refuted. Like the renowned Knight of La Mancha, the speakers displayed their prowess in reducing a wind mill.

The present elevated price of platinum has given rise to a new application of the plating art. Philosophical instrument makers in Paris are now selling capsules and crucibles of German silver plated with platinum. The plating is applied to the interior of the vessels, or both to the interior and exterior. These crucibles for chemical purposes have always been made of solid platinum, but those made of German silver platinum-plated are found to answer just as well and are, of course, much cheaper.

It is said that the telegraph played an important part, in a rather original manner, in suppressing the recent attempt at a revolt against the Portuguese government in which the natives of Oporto indulged. The ring-leaders of the conspiracy made use of the telegraph in communicating to their friends in other districts, but, with child-like simplicity, made use of a code so transparent that it could not fail to attract attention in a country where messages are subjected to government supervision. Numerous telegrams were sent in all directions to this effect: *"The invalid will not outlive the night."* The authorities very naturally "smelled a rat," and took measures calculated to insure that the "invalid" should not only outlive the night, but also stand a fair chance of living on and recovering full health. The telegrams, of course, never went further than the station of origin, and the uprising in other towns that the ring-leaders of the revolution counted on never took place.

TELEGRAPH RATES IN GERMANY.

The telegraph in Germany does not cater to the press by allowing the transmission of newspaper telegrams at reduced rates, as is customary in all other countries where the telegraph is firmly established. Dr. Stephan, the director of the German telegraph administration, recently declared in the Reichstag that he saw no reason whatever for favoring a reduced rate for press messages. This is a strangely illiberal policy to pursue, both towards the press and towards the public, which is directly interested in the prompt dissemination of news. Dr. Stephan stated that in a total traffic of 14,000,000 words, the press messages only amounted to 200,000 words, or about one and one-half per cent. This very poor showing is not at all to be wondered at in view of the fact that the newspapers have to pay full rates for their telegrams.

THE PATENT CENTENNIAL CELEBRATION.

Elaborate arrangements have been made to celebrate the beginning of the second century of the American patent system, at Washington, on the 8th, 9th and 10th of April next. All of the railroads leading into the national capital have reduced their rates for the occasion, and a great crowd is expected. President Harrison will open the celebration, and the literary exercises will be presided over by some of the most eminent inventors in the country. Twenty addresses upon the different phases of invention will be delivered by men who are famous as masters of the subjects they will discuss. A national association of inventors and manufacturers of patented articles will be organized. There will be a reception at the Patent Office by the Secretary of the Interior and Commissioner Mitchell, at which it is expected Cyrus W. Field, Thomas A. Edison, George Westinghouse, George M. Pullman and others will assist. There will be a military parade, an excursion to Mount Vernon, a planked shad banquet at Marshall Hall near Mount Vernon, and the Navy Yard, the National Museum, the Patent Office and other interesting national establishments will be open to visitors.

This is the first time in the history of the republic that the inventors have celebrated.

TELEPHONE RATES AGAIN.

The usual annual talk is now being made in the newspapers and at Albany about a bill to lower the charges for telephone service. We have, on other occasions, pointed out how enormous is the outlay demanded of a telephone company in such a city as New York, in apparatus, buildings and cables, and it is a waste of time to again show that the relation between the cost of production and the selling price, as applied to telephone service, is by no means out of proportion to that which obtains in other successful commercial enterprises.

One fact, however, we would press upon the attention of the agitators for lower rates; and that is, that the value of telephone service to the average business man is not represented by what he pays to the telephone company for supplying it. That the service, to most of those who use it, is worth more than it costs them, is easily apparent to anyone who has ever been inside of a telephone office, and has seen the importunity with which subscribers demanded restitution of service, when, by reason of any of the numerous "troubles" which afflict telephone systems, it has become interrupted. That this anxiety is not caused by the mere commercial desire to get their full money's worth is obvious, as rebates are always allowed for the time during which a line is inoperative; it is caused simply and solely by the fact that, to most business houses, the telephone is an absolute necessity, and to be without it means to lose time and money.

This has been amply emphasized during the past Winter when so many telephone lines were cut off from "central" by the ravages of snow and wind. The complaint on all sides then was that to be without the telephone meant to lose money every day—to lose more money every day than the telephone costs in a year—and there is little doubt but that many subscribers who were without service for a week or two during repairs would gladly have paid ten times the ordinary rate for service if it could have been restored any quicker than it was.

The average business man has little sympathy with the agitation for cheaper rates. He knows that telephone service is worth more to him than he pays for it to-day. He wants good service and is willing to pay a fair price for it; and he knows that if a cheaper rate is enforced, the value of the service must necessarily be reduced.

HORSE CARS ON THE WANE.

During the next year, many changes in the existing methods of surface transportation in New York city will take place. The large horse car companies are preparing the way by laying down new rails, buying property for car sheds, and so on. Commenting on these things, our esteemed contemporary, the *Evening Sun*, says:

The point to be noted in these changes is that the employment of horses as a means of traction for public conveyances is gradually coming to an end. It is strange that this conclusion should be reached at a time when the efforts of our municipal authorities have been directed to securing a better and smoother pavement than has hitherto prevailed in our principal streets. Yet the unevenness of our pavements in itself was not sufficient to cause the change from horses to mechanical traction.

The mortality of horses in New York city during the Summer months is very high. Dr. Liautard, a distinguished authority on veterinary surgery, thinks that the great average mortality of city horses is due more to hasty feeding than to midsummer heat and humidity. Whatever the reason, the spectacle of weary horses dragging, with difficulty, heavily laden street cars under a broiling sun, is not likely to be among the experiences of the next generation. Mechanical traction of one kind or another has come to stay.

The New York Board of Fire Underwriters has passed a resolution complimenting the officers and men of the fire department for their efforts in maintaining the service during and after the memorable sleet-storm of January 25. The resolution also urges that the wires of the fire department be placed underground as speedily as possible.

CORRESPONDENCE.

OUR CHICAGO LETTER.

Mr. George Cutter is at present absent on a ten days' business trip.

Mr. F. S. Terry, manager Electrical Supply Co., is still in the East on business.

Mr. L. N. Palmer, of the Detroit Electrical Works, was in the city a few days this week.

Mr. J. R. Burdick, of the H. W. Johns Manufacturing Company, was a recent visitor in Chicago.

The National Engineering Bureau is at present making some exhaustive tests of incandescent lamps.

Mr. Frank B. Rae, electrician of the Detroit Electrical Works, is at present enjoying a few weeks' vacation and rest.

Mr. C. M. Barclay, of the Electric Construction and Repair Company, has gone on a three months' trip to Jamaica, West Indies.

The Sperry Electric Company are running to the utmost capacity to supply the demand for their apparatus. The new regulator is taking fast.

The St. Louis Cable and Western Street Railway Company have decided to replace their present cable system with an entire electric equipment.

Chandler & Littlefield say they have the agency of the ideal compound engine of the country. They are receiving numerous inquiries about "The Triumph."

The Mosher Arc Lamp Company are to be congratulated on the receipt of a great many complimentary letters speaking in the highest terms of their arc lamp for incandescent currents.

Two Car Loads of Simplex Wire were delivered at the warerooms of Mr. George Cutter in the Rookery this week. The new two-part vulcanized rubber insulators for sale by the firm are having a ready sale.

Mr. G. A. E. Kohler, western manager for the Eddy Motor Company, has just closed a contract with the Chicago *Daily News* for a 3, 4 and 7½ horse-power motor for driving the ventilating fans in their new building.

Mr. G. M. Angeer has perfected a new snap switch which will be placed on the market shortly by the Great Western Electric Supply Company. This house carries at all times a complete line of electric fixtures.

The Appointment of Mr. F. Sargent, one of the members of the Chicago Electric Club, as assistant or consulting electrician to Prof. J. P. Barrett, gives universal satisfaction. Mr. Sargent is well qualified for the position.

The Demand for the Great Western arc lamp has increased to such an extent that it has become necessary to extend factory facilities. This company have their new electric railway apparatus catalogue about ready for distribution.

The Standard Oil Filter Company, manufacturers of the Ellis oil filter, report an excellent trade. A well-known feature of this particular filter is that the oil is compelled to pass upward through different compartments and leaving all the impurities behind.

Mr. Bailey, western manager of the J. A. Roebling's Sons' Company, has just closed two large contracts for feeder and trolley wire; one with the Minneapolis, Minn., Street Railway Company, of Minneapolis, the other with the St. Paul City Railway Company, of St. Paul, Minn.

Mr. Thos. Spencer, electrician of the North American Construction Company, of Pittsburgh, was in the city this week. Mr. Spencer will be remembered as the electrician in charge of the 50,000 incandescent plant, Westinghouse system, recently completed in London, England.

Mr. W. H. McKinlock, president of the Central Electric Company, is at present in the East on a short business trip. Mr. McKinlock's company will have several important articles for those interested on the market in a few days. Their new catalogue is just about ready for distribution. Send for one.

Mr. A. H. Lewis, manager street railway department for the Central District of the Thomson-Houston Company, with headquarters at Cincinnati, spent a day in Chicago last week. Mr. Lewis has in the last 30 days closed some nice contracts and is well pleased with the business outlook at Cincinnati.

J. A. Rohmberg, president Dubuque Street Railway, passed through Chicago recently *en route* to Philadelphia, stopping in the World's Fair City a few hours. Mr. Rohmberg has had in operation for some months an accumulator car furnished by the Accumulator Company, of New York, and speaks in the highest terms of the car and goes East to increase the equipment of the road with storage battery cars.

Mr. P. K. Andrews, western selling agent of the J. G. Brill Company, has just sold to the Marion Street Railway Company, of Marion, Indiana, six cars and six of the Brill patent motor trucks. Mr. A. H. Lewis, of the Thomson-Houston Company, recently sold the electrical apparatus for the same. Another sale reported by Mr. Andrews is that of five Brill patent motor trucks to the Sioux City Street Railway Company.

The New York Safety Steam Power Company, through their western agent, Mr. M. Thomas, report the following sales: To the Columbus, Ohio, Electric Light Company, one 100 horse-power engine, making the fourteenth engine sold this company; Hiawatha Electric Light and Power Company, Hiawatha, Kan., one 60 horse-power engine, the second one sold this company; Wm. Ruehl Bridge Company, Chicago, one 30 horse-power; Hanson Fur Company, Chicago, one 35 horse-power.

Among Recent Sales of central station plants by the Chicago office of the Thomson-Houston Company are the following: Lincoln Gas Co., Lincoln, Neb., three 50 light arc, 2,000 candle-power dynamos. Thomson-Houston Electric Light & Power Co., Quincy, Ill., one 1,300 light alternating dynamo and one 80 light and power generator for stationary motor work. Monroe Electric Light & Power Co., Monroe, Wis., one 1,300 light alternating dynamo. New Port, Kan., 50 arc and 300 light alternating machines. El Paso Electric Co., Colorado Springs, Colo., 35 arc dynamo. Arkadelphia Water & Light Co., Arkadelphia, Ark., 30 arc and 650 alternating machines. Increased Economy Light & Power Co., of Joliet, Ill., 150 lights, arc. L. W. C.

Chicago, March 14.

OUR BOSTON LETTER.

Mr. Geo. B. Durfee, of Fall River, Mass., president Carr Metal Company, was in the city early in the present week on a short business visit among the electrical supply houses.

The Shipman Engine Company, of this city, has just sold a two horse-power engine to run a 20 light (incandescent) dynamo at Mitchell's popular restaurant, East Boston, Mass.

The Thomson-Houston Electric Company has in contemplation the building of a glass factory at an early day which will be adjacent to its works, and will greatly facilitate the production of the company's lamps.

Mr. Fred. Angell, formerly with the American Electrical Works, Providence, R. I., and more recently with The John A. Roebling's Sons & Company, Trenton, N. J., has become associated with the electrical supply house of Messrs. E. M. Carhart & Company, Providence.

Manufacture of Electric Locomotives has already become an important product at the extensive works of the Thomson-Houston Electric Company, at Lynn, Mass. Among the locomotives recently finished, one for freight hauling will go to Whitinsville, Mass., and two others for mining use to Denver, Colo.

Electric Freight Railway.—A petition has been introduced in the Rhode Island legislature for an act to incorporate the Fall River Electric Freight Railway in that State. This act is rendered necessary from the fact that the proposed road of this company lies for a distance of about a quarter of a mile, near the southern shore of Laurel Lake, beyond the State line and in Rhode Island.

The Thomson-Houston Motor Company has, it is reported, made an agreement with the Crocker-Wheeler Motor Company, of New York, whereby the latter will manufacture small motors for the former which will be sold as Thomson-Houston machines. The motors will be in six sizes, ranging from one-twelfth of a horse-power to not exceeding one horse-power.

The T. M. Foote Regulator Company, this city, formerly located at No. 271 Franklin street, has established itself in commodious offices in the New Exchange Building on State near Congress street. The company's works are at Ashland, Mass. Messrs. Chandler & Littlefield, No. 40 Marine Building, Chicago, are western agents for the company named.

A Good Financial Showing.—At the annual meeting of the Fall River Electric Lighting Company, the following board of officers was elected: F. S. Stevens (president), J. D. Flint, W. H. Hathaway, E. L. Anthony, F. L. Dodge, O. S. Hawes. Owen Durfee was re-elected clerk and treasurer. The treasurer's report showed the total assets of the corporation to be $124,743.11; liabilities, capital stock, $102,200; accounts payable, $20,739.87; profit and loss, $1,803.24. Total receipts for the year, $31,989.88; expenditures, $24,118.94; net profits, $7,870.94; out of which $5,850 have been paid to stockholders in dividends. W. I. B.

Boston, March 14.

Executive Committee Meeting.

THE GOVERNING BODY OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION HOLDS AN IMPORTANT MEETING AT THE ELECTRIC CLUB—JOHN W. BEANE ELECTED SECRETARY AND TREASURER—MONTREAL MEETING, AUGUST 25 TO 27.

The first meeting of the new Executive Committee of the National Electric Light Association was held at the Electric Club, New York, Saturday, March 14. The members present were Chas. R. Huntley, president; M. J. Francisco, vice-president; A. R. Foote, secretary and treasurer; and John A. Seely, A. J. De Camp, E. F. Peck, A. J. Corriveau, J. J. Burleigh, H. H. Fairbanks, C. R. Faben, of the Executive Committee.

Mr. Foote requested, as a personal favor, that his resignation as secretary and treasurer be accepted, to enable him to devote more time to work in connection with the Electrical Department of the U. S. Census. He reported $1,294.54 in bank, and not one dollar of unpaid claims against it.

Mr. Foote's resignation was accepted, to take effect April 1, 1891. President Huntley nominated Mr. John W. Beane, of Brooklyn, as secretary and treasurer. The nomination was confirmed.

Tuesday, Wednesday and Thursday, August 25, 26 and 27, 1891, were fixed as the dates of the next convention, to be held at Montreal, Canada. The headquarters of the Association will be at the Windsor Hotel. Arrangements were discussed for a very large electrical exhibit, to be open for the entire week.

Committees were appointed as follows:

Committee on Amendments to the Constitution.—Geo. B. Shaw, chairman; Marsden J. Perry, Hon. E. A. Armstrong.

Committee on Underground Conduits and Conductors.—M. J. Francisco, chairman; T. Carpenter Smith, A. M. Robertson, John A. Seely, M. D. Law.

Committee on Finance.—John A. Seely, chairman; E. F. Peck, H. H. Fairbanks.

Committee on Transportation.—Mr Edgar, Montreal, chairman; C. O. Baker, Jr., C. A. Brown, Henry D. Stanley, A. J. Corriveau.

The new secretary, Mr. John W. Beane, was formerly an officer of the United States Navy and spent ten years in the service. In 1885 he was one of the staff of the ELECTRICAL REVIEW. Shortly after this Mr. Beane accepted the agency of the Mather Electric Company for the Middle States. At the formation of the Tucker Electrical Construction Company, of this city, Mr. Beane identified himself with the new venture, becoming general manager of the company in 1888. The New England interests of the United Edison Manufacturing Company have received Mr. Beane's more recent attention. Mr. Beane will be a valuable officer of the National Electric Light Association. Mr. Foote the retiring secretary has been a faithful and industrious official, and will now devote his time chiefly to census work.

The Crocker-Wheeler Catalogue.

The new catalogue which the Crocker-Wheeler Electric Motor Company, New York, distributed at the late Providence Convention, should be in the hands of all the electrical brethren who did not secure one on that occasion. It presents an attractive appearance, and the instructive and well prepared matter within its covers is generously illustrated and worthy of careful perusal.

The text describes very plainly the construction of the company's electric motors and their special features. It also gives some valuable data in the way of tables, stating horse-power dimensions and cost of their various machines, with directions for setting up and running them. Considerable space is devoted to the smaller motors, one-sixth, one-eighth and one-twelfth horse-power, and their various applications. An electric fan and an electric pump, operated by these smaller machines, are novelties noticed in the catalogue.

PERSONAL.

Mr. Eugene F. Phillips, of Providence, passed through New York city last week on a trip to Montreal.

Mr. W. H. McKinlock, president of the Central Electric Company, Chicago, spent a few days in the metropolis last week, booming the World's Fair.

Mr. B. Persicaner, of Vienna, prominent in electrical circles of Austria and Germany, with houses at Vienna, Buda-Pesth and Hamburg, is visiting the United States and making his headquarters in this city.

A man of the name of H. C. Spalding is engaged in promoting a tunnel railway enterprise in Boston. It is almost needless to state that the gentleman in question is not Mr. Hollon C. Spaulding, secretary of the Thomson-Van Depoele Electric Mining Company.

Mr. A. Vaughan Stevens, managing director of the International Okonite Company, Limited, of London, is visiting in the United States. Mr. Stevens takes great interest in electrical development in this country, and is thoroughly awake to the great future of the industry.

U. S. Senator Plumb and Congressman Bishop W. Perkins were visitors in the metropolis last week, and paid the REVIEW a friendly visit. No man in public life takes more interest in electrical progress than Senator Plumb, and in his opinion much valuable work to the industry at large may result from the Electrical Commission appointed for the District of Columbia by the last Congress.

Just Getting Acquainted with the Girls.

The news comes from Berlin that the employment of female operators in the telephone offices having been found so satisfactory it has been decided to appoint only women for these posts in future. The telephone is extensively used in Berlin. There are over 12,000 telephones there, not including private installations. Young lady operators have been employed in this country for ten years or more.

FINANCIAL.

Closing quotations of electric stocks, from F. Z. Maguire & Co., Electrical Securities, 18 Wall street, N. Y., Saturday, March 14, 1891. New York, Boston and Washington Stock Exchanges. Pittsburgh closing March 13.

NEW YORK.	
Western Union Telegraph Co.	80⅜
American Telegraph & Cable	79¾
Central and South American	
Mexican	
Commercial Cable Co.	106
Postal Telegraph Cable	
Edison General Electric Co.	103
" " "Deferred	
Consolidated Electric Light	
Edison Electric Illuminating Co.	
United States Electric Light	
North American Phonograph	
BOSTON.	
Thomson-Houston Electric Co.	43⅝
" " " Preferred	25¾
" " " Series C	
" " " Series D	6½
" " International Co.	210
" Welding Co.	
" European Welding Co.	55
Ft. Wayne Electric Co	129½
TELEPHONE:	
American Bell	199
Erie	47½
New England	50
Mexican	.90
Tropical American	.60
MISCELLANEOUS:	
Edison Phonograph Doll	
WASHINGTON.	
Pennsylvania Telephone	25
Chesapeake and Potomac	57
American Graphophone	7
United States Electric Light (Wash'ton)	184
Eckington and Soldiers' Home Electric Railway	86½
Georgetown and Tennallytown	59½
PITTSBURGH.	
Westinghouse Electric Mfg. Co.	107⅝

The aldermen from the outlaying wards of Detroit, Mich., will endeavor to have the present yearly appropriation of $150,000 for electric lighting increased to $160,000, owing to the demand for light by their constituents.

"Journal of the Institution of Electrical Engineers," for February, 1891, a complete list of officers and members and an index to Volume XIX of the Journal, have been received. The total number of members is 1,759, classed as follows:

Honorary Members	3
Foreign Members	172
Members	468
Associates	1,027
Students	89
Total	1,759

Telephonic News

*** The American Bell Telephone Company, Boston, has declared a dividend of $3 per share, payable April 15.

*** A dispatch from Schenectady, N. Y., says: "The report which appeared in several papers to the effect that the Edison works of Schenectady proposed to move to Saratoga is absolutely false."

*** The American Telegraph & Telephone Company (long distance) is seeking a special charter for the Union Telegraph & Telephone Company, of Rhode Island, in that State. The provisions of the charter allow it to exercise the law of eminent domain in constructing its lines.

*** Superintendent Root, of the New York and New Jersey Telephone Company, offers a reward of $50 for information that will lead to the arrest and conviction of any person who has taken wires from the company in Union and Middlesex counties. Address him at Elizabeth, N. J.

*** The first death in the world, so far as known, from artificially conducted electricity was that of Professor Richman, of St. Petersburg. He devised what was practically the first lightning rod and was killed by it. He ran an iron to the top of his house in present lightning rod manner and waited for a thunder-storm. It came. There was a terrific flash of lightning. The professor's appliance worked well and he was found dead by the side of it.

Telephone Drop Suit may be Brought.

It is reported that the Tropical American Telephone Company, who own the Heiser patent covering the Williams annunciator drop used in hundreds of switchboards throughout New England and the United States, are soon to begin suit against the Western Electric Company, of New York, and the New England Telegraph and Telephone Company, of New England, for infringement of this patent, the former for manufacturing and selling, and the latter for using these drops. The Boston fire department has surrendered 100 of these drops at the suggestion of the Tropical American Telephone Company.

Board of Electrical Control.

The Board held a meeting at the Mayor's office, March 11. The Subway Commissioners were notified that both sides of Lincoln avenue, from 132d to 141st street, were occupied by poles owned by the Western Union and Postal Telegraph Companies. Efforts to induce these companies to unite and use only one side of the street have resulted in failure.

Mayor Grant asked Engineer Kearney why his orders in reference to the poles on one side of the street had not been carried out. Mr. Kearney replied that the original owners of the Postal Telegraph plant had secured an injunction from the United States Circuit Court restraining the present lessees of the property from making any changes in the property.

Mr. Kearney reported that several of the electric lighting companies want subways in streets which have recently been repaved. The Mayor said they ought to have asked for them last year and asserted that the streets should not be torn up now.

President Lauterbach, of the Subway Company, reported that last year his company built over 66 miles of subways, of which less than five miles are now in use. Several representatives of electric companies explained that it was impossible to make connections, because Public Works Commissioner Gilroy would not permit the streets to be torn up in Winter.

The Telephonic Reproduction of Speech.

BY E. MERCARDIER.

The principal object of the telephone is the reproduction of speech at a distance with all its component elements; the articulations with their inflections, the vowels and diphthongs with their characteristic accents, timbre with all its delicacy, and the whole reproduction with sufficient intensity. But the transformations of energy, which go to make up telephonic effects, tend to injuriously affect the human voice.

Alteration of Timbre.—This consists in the production of a disagreeable snuffling, which often distorts words. I pointed out in a previous communication* that this impairing of the timbre was due to the fact that frequently the movements due to the production of the fundamental note and the harmonics of the telephone diaphragm were superimposed on those due to the voice, without, however, becoming confounded with them. Hence, a more or less great disturbance of the electric waves, which reach the telephone receiver, of the movements of the molecules of the diaphragm, and finally of the sound waves, which result from these movements, and which reach the ear of the listener. If my theory be correct, it was not necessary in order to correct this alteration of timbre to take a diaphragm the fundamental note of which is the superior to the limits of the sounds emitted in articulate speech, that is to say, one whose fundamental note is somewhere about ut_4 for men and ut_5 for women. Then the human voice would not tend to produce the fundamental note and harmonics of the diaphragm, which would no longer coincide with the tones of the human voice. Moreover, in order to produce them it would be necessary (owing to the stiffness of the diaphragm) to employ a mechanical force greater than that which the human voice is capable of exerting when speaking. This has been verified by experiment. I will only cite two extreme cases. A diaphragm of 100mm. diameter and 1mm. thick, or one 30mm. diameter and 1mm. thick. Both satisfy the condition mentioned above, and, fixed to appropriate telephones, neither of them produces a sensible alteration in the timbre of the voice.

Alteration of Articulations and Vowels.—This consists on the one hand of the exaggerated predominance of certain consonants, vowels and syllables, *p, b, r, k, a, o, an, on, ent*, and in the marked weakening of *l, s, c, z, i, e* and *u*. The consequence is, that it is frequently very difficult to understand the meaning of a sentence and to decipher the words distorted in this way. Hence, a constant source of error. The alteration is due in large measure to the shape and aperture of the buccal cavity, which are different in the pronunciation of the various articulations and vowels mentioned above, and to the resulting energy of the sound waves being much weaker in the second case than in the first. From this point of view, this distortion would seem inevitable, but it is also due in some degree to the correlative production of the harmonics of the diaphragm. In fact, while seeking to remedy this defect, I found that it was markedly diminished by precisely the same method as indicated above, employed to suppress the alteration of timbre, that is to say, by suitably proportioning the thickness and diameter of the diaphragm so that its fundamental note shall be very sharp.

The line joining the transmitter to the receiver also plays a certain part in this connection, which I hope to examine later on.

Various Effects.—The third difficulty which is present in a large number of telephones is the production of two parasitic resonances. One of these is not very inconvenient, since it is weak, and only noticeable by trained ears. It consists in metallic crackling, which seems to me to be due to a kind of friction along the radii of the diaphragms, caused by a change in the direction of the lines of force. This effect disappears in a diaphragm with a high fundamental note, either because it is then too shrill to affect the ear, or because it is not produced at all, owing to the mechanical force necessary for its production being greater than that which the human voice can exert. The other effect is more intense and of greater tonality; it is the resonance due to the mass of air enclosed in the telephone box itself. To cause this vague effect (composed to some extent of the various inflections of the timbre of the voice) to disappear, it is only necessary to take the precaution to leave a very small air space underneath the diaphragm, which can be attained by filling the interior of the boxes with felt. We thus see that apart from this last effect, which is easily eliminated, the distortions suffered by articulate speech when reproduced telephonically can be considerably diminished, if not entirely obviated, and this by a simple means, the same for all, consisting merely in the employment of diaphragms having a high fundamental note, whether they have considerable thickness and considerable diameter, or are thin and of small diameter. At the same time that we obtain clearness in the reproduction of speech, we satisfy the conditions necessary to obtain sufficient loudness,* a very fortunate circumstance, since the two desiderata of clearness and loudness are equally indispensable. This fact thus permits us to approximate perfection in an instrument as delicate as it is marvelous.

* *Comptes Rendus*, September, 1885.

The Aluminum Carbon Company.

The Aluminum Carbon Company has bought four acres of land in Lancaster, N. Y., and will proceed at once to erect buildings and put in machinery for the manufacture of electric light carbons. The main building will be 60x170 feet.

The Aluminum Company has a capital stock of $40,000, and its officers are as follows: President, Andrew Cant; vice-president, R. J. Getz; secretary and treasurer, F. V. Doty; superintendent, W. H. Boulton.

In addition to the manufacture of carbons and other electric appliances, the company will furnish electric power to manufacturers as well as electric light. Mr. Boulton, the superintendent, is a well-known pioneer in carbon manufacture.

GENERAL ELECTRICAL NOTES.

Toledo will build an electric railroad to Maumee, O.

A stock company is being formed at Mancelona, Mich., to put in a complete system of water works for the city. It is the intention to add an electric light plant.

At Kansas City the Western Electric Storage Battery Company has been formed; capital, $500,000. Directors, Thos. F. Clohesey, A. J. Vanlandingham, Hugh J. McGowan, S. M. Stevens, Thos. Toohey, Henry Berranor, Kansas City, Mo.; N. McAlpine, W. B. Stone, A. A. Lovelace, Chas. Lovelace, V. J. Lane, Kansas City, Kan.

The Southwestern Gas Association held its convention at San Antonio, Texas, March 10 and 11. The following papers were read: "Candle Power in Competition with Electric Lighting," by Leonard Gill; "Electric Lighting in Connection with Gas Lighting—Comparative Prices and Profits of Each," by J. J. Walsh; "The Alternating Current," by J. H. Mason.

The Bridgeport Brass Company one of the best known and most successful manufacturing companies in the United States, is a leader in the manufacture of copper wire. It is a matter of history that this enterprising company was the first to manufacture hard-drawn copper wire, and since that time this branch of the company's business has grown to immense proportions.

George W. Greater, proprietor of the Citizens' Street Railway, of Vincennes, Ind., sold the property, franchises and everything connected therewith to a new company last week, composed of Capt. Allen Tindolp, of Vincennes, and B. G. Hudnut and D. C. Greiner, of Terre Haute. The new company immediately took possession and will largely improve the plant by putting in an electric motor system and extending the lines.

The Eureka Tempered Copper Company, of North East, Pa., have arranged with the American Railway Equipment Company, of New York and Chicago, to act as their general agents with railroads and in all territory west of the Mississippi River. With this addition to their canvassing force and the trade already established, they will be kept busy during the coming year. They report large orders during February from the Edison General Electric Company, the Wenstrom Consolidated Dynamo and Motor Company, the Electro-Dynamic Company, the National Electric Manufacturing Company and the Baxter Electric Motor Company, for their tempered copper, and in finished work for electrical central stations they received upwards of 100 orders in the month of February alone.

* *Comptes Rendus*, vol. cxii, p. 97; *Electrician*, January 23, 1891, p. 368.

OUR ALBANY LETTER.

Mark W. Dewey, of the Dewey Manufacturing Company, of Syracuse, N. Y., has patented an apparatus for the use of electricity in place of steam as a power to drive fire engines.

A Bill was introduced in the Assembly at Albany, Thursday, by Mr. Sutherland, providing that the telegraph linemen in the Brooklyn Police Department shall be entitled to the benefits of the Police Pension Fund. A bill was also introduced by Mr. Stein, amending the electrical execution law by striking out the provision which prohibits the publication of the details of electrical executions.

The Representatives of the Rochester Electric Railway met the trustees of Lewiston, N. Y., recently at the town clerk's office, placing before them the business of the company and the great benefit to be derived from an electric road running direct from Rochester, on the Ridge Road, to Lewiston. The trustees were unanimous in the approval of an electric road running on Main street, but there was a slight difference of opinion whether the railway should be on one side of the road or in the center. The majority ruled that as Main street was 100 feet wide, the tracks should be placed in the center of the street. A Rochester gentleman has extended an invitation to a number of Lewiston gentlemen to become his guests, when he will make them thoroughly acquainted with the electric system in his city.

The Report of the Hudson River Telephone Company for the year ending December 31, 1890, is out. In the report of the directors to the stockholders of the company, the statement is made that a charge was made against earnings for $11,535.67 from litigation with the Watervliet Turnpike Company. Quarterly dividends have been paid during the past year aggregating $41,208.14. The advance in rates throughout the district noted last year has continued, being partly due to the use of metallic circuit instruments, for which there is a growing demand at all the principal exchange centers. The net revenue of $51,505.43, plus the surplus of $15,867.71 of January 1, 1890, made an amount on hand of $67,373.14. Out of this four dividends were paid during 1890, amounting to $41,208.14, leaving a surplus on January 1, 1891, of $26,165, which, with the proportion of Westchester earnings, leaves a total surplus of $49,837.13. The company's resources are $2,078,840.14; liabilities, $3,052,675.14. In addition to the long distance facilities afforded by the American Telephone and Telegraph Company, they now offer their subscribers metallic circuit connections with Schenectady, Amsterdam, Johnstown and Gloversville, a new line having been constructed to these cities of standard, 45 foot poles, equipped with four copper loops. The $18,977.14 added to the construction account during the year was mainly expended on this line and in the purchase of poles, which are now delivered, on a proposed extension from Schenectady to Saratoga and from Saratoga to Troy, work on which will be commenced as soon as possible in the Spring.

The Destruction of the Telephone Exchange.—Again has the telephone service at Albany suffered through the effects of a heavy storm on the wires. Monday night the central office was visited by a disastrous fire caused by crossed wires. The rain, with accompanying wind, which began to fall in the afternoon, misplaced telephone, telegraph and electric wires generally. The crossing of the wires began at 10 o'clock, and the lower streets of the city were brightened by flashes of intermingled telephone, telegraph and electric light wires. They became terribly tangled. By the fire the big office of the Hudson River Telephone Company was practically ruined. At 11 o'clock a fire alarm was sounded, caused by the discovery that several telephone sets had burned out. At first no particular care was exercised, as it was thought that by cutting out the wires and using extinguishers the danger would be averted. Almost immediately the conduit leading from the distributing room to the switchboard room was filled with roaring flames. The extinguishers appeared to be useless in subduing the flames. In a short time the great switchboard was a smoking wreck, completely ruined. Comparatively few moments were required to utterly destroy the switchboard which had required the services of 40 men six weeks in its construction. The cost of the board was $12,000, and the connections cost $5,000 more. It is insured for $11,000. It will be weeks before the local telephone service is again of value. It is completely paralyzed. Wires dangled from the building and put pedestrians in great danger. Telephones caught fire from foreign and powerful currents and were with difficulty extinguished. One of the oldest and best horses in the fire department, "Billy," was killed by contact with a live wire, and his mate and driver had a narrow escape. The killing of the horse was followed by a panic among the crowd which had collected to view the fire. Several people were hurt, but

not seriously, and clothing torn off. About 10.45 P.M., a car on the Watervliet Turnpike Railway Company's line stopped in front of the post office. After the car, flash after flash occurred with startling frequency, and as the car approached the South State street line, a live wire fell down in front of it and burst into a flame. The car again stopped, but when the current was turned on again flames issued from the joints in the rails, caused, doubtlessly, by the burning out of the return wire of the circuit, which lies beneath the rail. A magnificent display of electrical pyrotechnics occurred, until the current, at the company's power station, was turned off. Manager Uline, of the Hudson River Telephone Company, was in New York at the time the fire occurred. He was notified of the matter by long distance telephone. A temporary switchboard has been ordered and will be put in as soon as possible, until an entirely new switchboard, which has been ordered, is completed. A large force of electrical experts has been brought from New York to aid the company in getting in shape again. The loss to the company is between $20,000 and $30,000. L. M. W.

Albany, March 14, 1891.

Electric Railway Items from the West.

The St. Louis, Mo., Cable and Western Railway will substitute electricity for the present cable system. The system has not been decided on as yet.

The Cass avenue, Union and Bellfontaine Railway Company, of St. Louis, after due consideration have decided to throw out the cable and adopt electricity. This will mean the building of one of the largest electric roads in the country.

The West Side Railway Company, of Kansas City, Kan., have adopted the Rae system. Six motor cars of 30 horse-power capacity each have been ordered from the Detroit Electrical Works.

The New President of the Air Brake Company.

Pittsburgh's financial circles were considerably excited last week over the result of the annual election of the Westinghouse Air Brake Company, in which Mr. Geo. Westinghouse failed of re-election as president. Mr. A. T. Rowand, the secretary of the company, by reason of his proxies, was elected in place of Mr. Westinghouse. A dispatch from Pittsburgh gives the sequel as follows:

A. T. Rowand, who joined with the Eastern stockholders of the Union Switch and Signal Company and by voting proxies caused the overthrow of Geo. Westinghouse, Jr., and his friends, at the annual meeting, is lying dangerously ill at his home. Mr. Westinghouse was in New York at the time of the meeting, but took the first train for home. A conference with the new board resulted in Rowand being deposed and the election of E. H. Goodman, of Boston, as president of the company. When Mr. Rowand was informed of the change he fell unconscious to the floor at the Duquesne Club. He was removed to his home, where he now lies in a critical condition. It is said he was stricken with apoplexy. Mr. Rowand was formerly secretary of the company. By the terms of the new agreement, he is to be vice-president at a nominal salary.

Mr. Westinghouse issued a statement in which he says no adequate financial plans seem to have been made by the new board to carry on the business and to provide for maturing paper. He feels, he says, that he has now been freed from all responsibility concerning the management of the business and naturally cannot, and probably will not, be asked to give any further advice or help of any kind. In case of a failure on the part of the new management to protect the credit of the company, there will be required the united efforts of the stockholders to prevent serious losses that will result. The statement concludes as follows:

"Mr. Westinghouse, mindful of the possibilities, has already perfected a plan for the reorganization of the business of the company that will guard the interests of all in an equitable manner, should such a course become necessary in order to maintain the business which has been brought to a prosperous condition."

The London and Paris Telephone Line.

[From London *Electrical Review*, March 6.]

The submersion of the cable which completes the telephone line between London and Paris will probably have been affected ere these pages leave the printer's hands, and next week experimental work will be carried out through the circuit prior to the opening of the line for public use. A great deal will probably be made of the fact that telephonic communication has been effected between the two capitols, though the feat, if it can be called such, is not actually one of particular magnitude, for a longer length than the one in question (telegraphically), including 28 miles of cable, has been for some time in operation in South America with success. Great care has, however, been exercised in the case of the London-Paris line to make the conditions for working as favorable as possible, and the cable and aerial wires have been specially designed for the purpose; the margin allowed within the breakdown point of good speaking is large, the "K R" being a little over 5,000, as compared with 10,000, the limiting value; there is little fear, therefore, but that excellent speech will be attained. As regards the financial value of the line, it is extremely difficult to give a forecast; opinions differ, we believe, considerably on the point. Many express the belief that the opening of the line will be speedily followed by the construction of others of a like nature, rendered necessary for the large traffic which will pass over the wires. Personally we are not sanguine that such will be the case, and we imagine that the enthusiasm on the subject is more marked on the French than on the English side of the channel. However, the whole experiment will not be a costly or risky one, for should it be found that the traffic is not, after all, of a heavy nature, the wires would, of course, be available for ordinary telegraphic communication; and we believe that an extra link or two of this kind would not be a mere luxury, for the steady increase in telegraphic work across the channel must eventually necessitate additional means of communication.

Steamship Travel.

In the first of the steamship articles in the April *Scribner's*, John H. Gould says: "From the records kept in the Barge Office, in New York city, it appears that ocean travel varies according to the business situation in this country. Following is an exhibit of the number of cabin passengers that arrived at this port during the years between 1881 and 1890, inclusive: 1881, 51,229; 1882, 57,947; 1883, 58,596, 1884, 59,503; 1885, 55,160; 1886, 68,742; 1887, 78,792; 1888, 88,302; 1889, 96,686; 1890, 99,189. From one point of view, at least, these figures are very striking. In 1889 there was a great show in Paris that attracted world-wide attention and interest. In the Spring of that year every steamship agent announced to prospective passengers that all vessels would be crowded, and that the volume of passenger traffic between the continents would swamp the capacity of every line. But the figures speak for themselves. Viewing the increase of oceanic travel it appears that the financial depression of 1884 kept many people at home who otherwise might have crossed the ocean. After that distressing season had passed, travel resumed its normal condition, and an increase may be noted with each year."

The Lunkenheimer Brass Manufacturing Company, Cincinnati, O., announce that they have purchased the entire plant and good will of the Porteous Brass Manufacturing Company, of Cincinnati, manufacturers of brass goods, gate valves, etc., and the removal of the machinery and tools to their new addition, Nos. 11 and 13 East Eighth street, thus greatly increasing their facilities for the production of engine builders' and steam fitters' brass work, as well as their various well known specialties in valves, lubricators, oil cups and grease cups.

The Davenport Motor.

We illustrate on page 63 the electric motor made by Thomas Davenport, a Vermont blacksmith, in 1835. Mr. Franklin L. Pope, in his lecture before the Electric Club, speaks as follows of Davenport and his pioneer work:

During the six years between 1835 and 1841, he built more than 100 operative electric motors, scarcely any two of which were of the same design, and which varied in size from a small model up to an engine capable of driving a rotary printing press for 12 hours in succession. In December, 1835, he exhibited in Boston the model of an electric locomotive and circular railway which he had built in Springfield, and a similar though more finely finished model which was built by him the following year is still in existence in a good state of preservation. He published in 1840, now more than 50 years ago, in the city of New York, a weekly journal called the *Electro Magnet and Mechanics' Intelligencer*, which was printed upon a press driven by an electro-magnetic engine. Some of his motors, constructed as early as 1837 and 1838, were admirably designed, and in essentials, even to the shunt winding, differed but little from some of the most advanced and successful types in use at the present day. * * * * It may be affirmed with entire truth that he gave every effort of his life to the development of his idea, and at last sunk into his grave, as he himself well realized, a victim of disappointed hopes. Yet, if Davenport was an enthusiast, so are we all enthusiasts as respects our anticipations of the realization of the result which he predicted and for which he wrought unceasingly. Steam is nothing more than a convenient agency for the *transmission* of power, which derives its energy from heat and imparts it to mechanism. So soon as the great riddle of the day has been read—the production of electricity, as steam is produced, directly from heat—then, indeed, will the predicted triumph of electro-magnetism over steam become an accomplished fact. Forty years have passed away since all that was mortal of Thomas Davenport was laid to rest beneath the Brandon elms, yet I think there are not many present in this audience to-night who do not cherish the expectation, if not the conviction, that before the half century has been completed the great problem will have been solved, and the era of a new industrial revolution will have dawned upon the world.

Modern Physics.

So many people regard the atomic theory as a solid statement of fact, and the ether as existing "stuff," that engineers are now probably open to assimilate more scientific notions. Modern science declares that energy is much the same kind of thing as matter. Though it has no inertia, and is not acted on by gravity, it is indestructible and can always be localized like matter, and presumably occupies space as matter does, but independently of it. If energy disappears in one place it appears somewhere else, and in the meantime it moves from one place to the other. Professor Poynting, in his papers, which have formed the basis of some of these theories, carefully pointed out that he made use of assumptions; but that has been forgotten. Modern science also declares that action at a distance does not exist. The argument is that we cannot conceive it. Many people say they can conceive action at a distance quite as well as atomic lumps rattling together, but that is by the way. Modern science says: "What is inconceivable does not exist." As conceivability depends on experience, this is another way of stating that modern science has experience of the whole universe. Being told that a "pull" does not exist in Nature, and Professor Poynting having shown how energy moves about, we gather from the teachings of modern science that when a portable engine drives a thrashing machine, the energy goes from the engine to the thrasher, through every part of the universe except the belt. The belt is the only thing made or created that does not help to drive the thrasher. There are many other interesting cases of a similar kind, but perhaps one is enough to assimilate at a time.

TELEGRAPHIC

.... It is stated that a district telegraph system will be in operation in Fort Wayne, Ind., within 60 days.

.... The work of improving the telegraphic facilities of the Northern Pacific Railroad is being pushed in every direction.

.... The time ball on the New York building of the Western Union Telegraph Company will be put in commission during May.

.... The Commercial Cable Company has opened a cable office at 29 Spruce street, New York city, which is in direct communication with the company's ocean cables.

.... The Commercial Cable Company has declared a quarterly dividend of one and three-quarters per cent., payable April 1, to stockholders of record March 21. Books close March 21, open April 2.

.... The Chicago Board of Trade Telegraph Committee, of which D. L. Richardson is chairman, is said to be working patiently on the scheme to run a telegraph line from Chicago to New York.

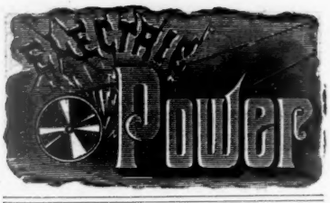
.... It is reported from Plattsburgh, N. Y., that the Commercial Union Telegraph Company's cable between Cumberland Head and Grand Isle is grounded, and no business can be done over it until the ice goes out.

.... Hartley Gisborne, superintendent of government telegraph lines in the territories, has been in Southern Assiniboia on official business in connection with the proposed telegraph line from Moosomin to Cannington Manor. The settlers in the south have agreed to freight all the material for the line, which, it is expected, will be built early in the Spring.

.... In building its new line from New York *via* Pittsburgh to Chicago, the Postal Telegraph Company has struck a snag in the way of opposing landowners. A case to take a right of way is pending against three Trumbull County, Ohio, farmers in the courts. The company find that the point at issue has never been passed upon by the Ohio Supreme Court, and will take it there to establish a precedent. All work on new lines is meanwhile stopped.

The New Era Accumulator.

The need of a thoroughly reliable accumulator has long been felt; and since the days of Plante many forms have been devised. The heretofore unsurmountable obstacles to the success of accumulators, it is claimed, have been thoroughly overcome in the New Era, which is so constructed that the expansion of the active material is thoroughly provided for and at the same time it is entirely enclosed within a metal pocket, making it impossible for it to get out or buckle. The plates, which are also very much lighter than ordinary plates, are six by eight inches, weighing only 23 ounces. The process of manufacture is very simple. The entire plate is made of sheet lead which has first been perforated with small holes, then placed between die plates that press the sheets into numbers of small hemispherical pockets with plain edges between, when after being slightly flattened and the pockets filled with the active material the two halves are joined together under heat and pressure with the aid of chemicals that it is formed into one solid plate with globular buttons filled with the active material, each button surrounded by a perforated shield. Thus a contact is obtained on all sides of the active material making it capable of taking on or giving off the current at a much greater rate. At the same time the electrolyte, passing through the perforations, penetrates every particle of the active material. The cells made in this way have shown remarkable capacity and efficiency, a small 100 ampere cell repeatedly melting a No. 8 copper wire in short circuit, without any damage to the cell. It will admit of a steady discharge of from 50 to 100 amperes and retain its capacity.



* * A syndicate of New York capitalists has virtually purchased the Globe street railway in Fall River, Mass.

* * The Manistee, Mich., board of aldermen passed a franchise for the electric street railway over the mayor's veto.

* * The New York *Commercial Advertiser* will move into a new building on Park Row, about April 5, and will put in a 20 horse-power Perret motor to drive their Hoe presses.

* * An electric car was brought into use, one day last week, to boost a big tobacco wagon that was stalled on the suspension bridge between Covington, Ky., and Cincinnati, O. The wagon had on seven hogsheads of tobacco, and the four mules tugged in vain to pull it up the grade until the car came along and, getting a shoulder hold, pushed the wagon, mules and all safely up the grade.

* * The sale of the Gloucester, Mass., street railway has been completed. President Henry Souther, of Boston, vice-president and general manager H. O. Flint and John P. Langmaid, of Salem, retire from the board, and Willard B. Ferguson, of Boston, and J. H. Cunningham and Mayor A. D. Bosson, of Chelsea, have been elected directors, the first becoming president, and Colonel Cunningham vice-president and general manager. Extensions are to be made, including a line to Lancesville, about seven miles. The main line is to be equipped with electricity at once.

Electric Motors in Court.

A one horse-power slow speed Crocker-Wheeler motor was wired up in the United States District Court, Post Office building, recently, to run a Linotype to show its workings in a patent suit. The motor elicited much favorable comment and was handled by the judges.

An Objection to Electric Roads.

Little Frankie is only three years of age, yet he bids fair to rival Bill Nye ere long.

"Frankie, do you want to come out with me and take a ride on the electric cars?" It was Frankie's papa who spoke.

"No, thir," was the prompt reply.

"No! Why not?"

"Don't like dem carths."

"What's the matter with them—why don't you like them?"

"Cauth dey run on a clothes-line."

Trolley and Snow.

Yesterday was the largest snowfall we have seen in Boston for many years. It tried the transportation facilities of even the railroads to the highest point. The West End electrics, though, made a splendid record. They were very little delayed anywhere, and on most lines not at all. The big snow ploughs and increased power did the work of keeping the tracks clear very effectively. It is only a question of time when all our lines will be run by electricity, and the sooner it comes, the better people will be pleased.—*Boston Record.*

A Freight Electric Railway.

In the Rhode Island Senate, last week, an act was introduced to incorporate the Fall River Electric Freight Railway, wholly within the town of Tiverton, the road to begin at a point in the boundary line between Rhode Island and Massachusetts, near the Shove Mills, and running southeast, skirting the shore of Laurel Lake to the boundary line, with eight rods way. The road is to be used for freight only. Nathaniel B. Church, William J. Brightman and Timothy W. Sprague are mentioned as three of the incorporators. The capital stock is placed at $5,000,000.

OUR WASHINGTON LETTER.

AN INTERESTING REVIEW OF CONGRESSIONAL ACTION RELATING TO ELECTRICAL MATTERS.

In the National Museum fund an item of $12,000 covers expenses for electric lighting, telegraph and telephone service.

The Senate and House of Representatives each has a telegraph operator, at $1,200 per year, and if there are any ambitious, sockless grangers among the craft, it is a good time for them to apply for positions.

The Lighthouse Board has $283,000 for lighting rivers in all parts of the country, and electric lighting men will have an opportunity of convincing the board that they can do this service better than any one else.

Among the Army Items there is $50,000 for the purchase of submarine mines and necessary appliances to operate them; and $1,200 for a ten horse-power gas engine to operate a dynamo machine at the Military Academy at West Point.

The Proposition to pay Stephen Vail $10,000 for one of the original Morse registers did not get beyond the Senate Library Committee, where it was pigeon-holed. The government is very anxious to have the instrument, but the price is too high.

An Appropriation of $18,179 was made for an electric lighting plant at the new naval observatory near this city. It is expected that the building will be ready for occupation and the instruments moved from the old observatory in the city during the next fiscal year.

Some of the REVIEW's enterprising neighbors have recently been publishing the names of new electrical corporations, said to have been organized in this city, which nobody else ever heard of, with the apparent result of greatly benefiting the job printers who furnish circulars to manufacturers.

The President is Authorized to have soundings made between San Francisco and Honolulu for the purpose of determining the practicability of laying a telegraph cable between those points. Twenty-five thousand dollars is appropriated, and the vessels of the navy will be used in making the survey.

The Bill Appropriating $50,000 for a special census of electrical industries, although supported by the strongest petitions from every part of the country, failed to pass. There was no opposition to it, but partisan squabbles dissipated so much time that there was little left for legitimate business.

The Navy Department gets a moderate amount for installing plants in the new vessels, but nothing for completing the plants in the Navy Yards at New York and Mare Island. Provision is made for an electrician at the New York Yard, at a salary of $1,000 per year, and in the Mare Island Yard, at $1,200.

A Strong Effort was made in Congress to secure the passage of a bill incorporating a company to lay a cable from San Francisco to the Sandwich Islands and granting an annual subsidy of $150,000 for 15 years; but as this would practically require the government to lay the cable and give it to the corporation, the project failed.

The Department of Agriculture, which is to take charge of the Weather Bureau on the 1st of July, will lay a cable between Tatoosh Island and Port Angeles, Washington, and also at Oregon Inlet, North Carolina, besides building some telegraph lines required for the extension of the weather reporting service. A Superintendent of Telegraphs for this Bureau is to be appointed at a salary of $2,000.

The Appropriation for Fuel, Light, Water, etc., amounts to $775,000, and Superintendent Powell will doubtless secure a fair share of it to keep his electric plants running, but little new work can be done. He is preparing plans for a new lighting plant for the Immigration Buildings, on Ellis Island, New York harbor, and hopes to get enough out of the building appropriation to pay for it, although the architect says there will be nothing to spare.

Interest in the Patent Celebration is spreading over the country and greatly increasing. All the indications point to a very successful celebration. Persons desiring to attend the meetings, or to secure copies of the publications, will do well to obtain tickets as early as possible. The committee is sending invitations to all interested parties whose addresses can be obtained, and the secretary, Prof. J. E. Watkins, will be glad to get the names of any who should be invited.

The Two Small Incandescent Lighting Plants in the Capitol have been kept running by the companies which put them in, at a rental of $200 per month, during the session. The attempt to get one plant to supply the whole building will be renewed next session. Provision has been made for paying for the underground wires which were run into the President's ground, a year or two ago, and an appropriation made to pay for the seven arc lamps used there at 40 cents per night.

Ten Thousand Dollars is for payment to the daughters of the late Joseph Henry, secretary of the Smithsonian Institution, for valuable services rendered by him. The passage of this item was due largely to the receipt by the Vice-President of a copy of a resolution adopted by the National Electric Light Association at the Providence meeting and promptly forwarded by Secretary Foote. The Misses Henry have very gracefully acknowledged this tribute to the memory of their father in a letter to the Association.

The Closing of the Fifty-first Congress leaves a fair proportion of disappointed men among the electrical fraternity. The attempt to secure the introduction of a system of electrical voting apparatus in the House amounted to nothing. It is hardly worth while for inventors to waste much time on this scheme until there is a radical reform in politics. At present, the right to vote often, and to spend a good deal of time at it, is so strenuously maintained by legislators, that improved methods of voting find no favor.

The Military Telegraph Operators' Bill came nearer success than ever before. It passed the House, January 8, was amended by the Senate Military Committee, and favorably reported by Senator Hawley, February 26. As amended, it authorized the Secretary of War to issue to each operator who served in the military telegraph corps, a certificate of honorable service, but granted no other rights. The advancement of this bill, which brought it so near final passage, was largely due to the persistent efforts of President Plum and the members of his committee on legislation.

The Price to be Paid for Public Arc Lights in this city, burning from sunset to sunrise and operated entirely on underground wires, has been reduced to 50 cents per night on a three year contract. The lighting company will be permitted to lay five miles of conduits, and the telephone company the same amount, pending action on the forthcoming report of the electric commission which is investigating the wire question. The commission has been given the additional duty of preparing a set of recommendations concerning the safe and efficient wiring of public and private building for all electric purposes.

The Government Telegraph Project, which has been so strongly urged by Postmaster General Wanamaker, and which rallied so many friends to its support, proved an utter failure, but the long and earnest discussion of the subject has had a very good effect in bringing the real issue clearly before the country. Hereafter, it will not be a simple question of determining whether it is expedient for the government to try a "harmless experiment" in doing a limited telegraph business, but whether the people of the country shall be allowed to carry on any private business without governmental interference. The strongest friends of the postal telegraph scheme are the people who desire the abolition of a republican form of government and the creation of a monarchy without a monarch. They demand the destruction of all corporations; governmental control of all means of communication and transportation, and unlimited distribution of currency, without regard to any basis of value. So long as the Postmaster-General works in harmony with this plan they will support him, but the telegraph matter is a very small item in the larger undertaking. There is an organized attack on the telegraph, telephone, electric and gas lighting, street railroad and other interests, by the socialists, under various guises, and their plans are far-reaching and dangerous.

In the Regular Appropriation Bills many items were stricken out, and the sums appropriated were far below the estimates. The Treasury Department's estimate of $125,000 for wiring the new custom houses and post offices, now in course of construction in various cities throughout the country, was entirely stricken out and nothing was allowed for this purpose. The following statement, made by the supervising architect, explains the situation:

> The advance made in lighting buildings by electricity has so thoroughly established the convenience and superiority of electric light that modern structures are incomplete without the system, and it has become a necessary equipment in the completion of a public building. At present, all matters, including wires, fixtures and plants for electric lights are to be provided from the appropriation for fuel, light and water for public buildings. Serious inconvenience has resulted in the prosecution of work on new buildings in consequence of the inability to proceed at the proper time to supply electric wiring in them, as there is no specific appropriation therefor, and the appropriation for "fuel, light and water" is often insufficient to meet the demands upon it, and, therefore, cannot always provide for the expenditure for electric wires in the new buildings. As the cost of running electric wires is considerable and proportionate with the size of the buildings, it is earnestly recommended that a separate appropriation, to be used in connection with the appropriations for the construction of new public buildings, shall be made for placing electric wires, that the buildings may have electric light, either from street service or from plants to be hereafter established in them.

G. C. M.

Washington, D.C., Mar. 13.

LITERARY.

"Bulletin de la Société Internationale des Electriciens," for February, 1891, has been received.

"Annual Register of the United States Naval Academy, Annapolis, Md.," for the academic year of 1890-91 has been received. There are 241 cadets on the roll.

Mr. W. J. Jenks has kindly sent us a catalogue of Sir Wm. Thomson's new standard electric instruments manufactured by James White, of London.

We have received from the author, Mr. Allen R. Foote, a treatise on "Municipal Ownership of Quasi-Public Works."

"Transactions of the American Institute of Electrical Engineers" for January and February, 1891, has been received.

Reports of the Smithsonian Institution and United States National Museum for 1888 have been received.

The Electrician "Electrical Trades Directory and Hand-book" for 1891 has been received. It is well printed and bound, and consists of about 1,000 pages, over 100 more than 1890 issue and 300 more than the edition of 1889. The book has been brought up to date, the very numerous business alterations taking place all over the world in the first month of the new year being recorded. A valuable feature is a series of portraits and biographical sketches of the more prominent electricians of the world. Other interesting and important features are a digest of the law of electric lighting (specially written); a list of central stations in the United Kingdom for the distribution of electricity; a list of electrical railways and tramways; a summary of the leading electrical events of the past year; information relating to the obtaining of letters patent, and a complete list of the local authorities of England. To American electrical men the book is very valuable; to our English brethren indispensable.

Copper.

There has been no change in the copper market. Consumers buy very indifferently, and still act as though influenced by the concessions thus far made by the mining companies. At the present time there is an abundance of Lake Superior ingot on sale at 14 cents. Whether a lower price would be accepted is uncertain, but the undertone has a weak appearance.—*Boston News Bureau.*

Another on the Phonograph.

We are not responsible for this:

Did it ever occur to you that, while there are many things that "go without saying," there is at least one thing that doesn't go without saying and that is the phonograph?

This was constructed by a well-known milling firm who, in sending it, say, "for Heaven's sake conceal the source." Of course, we comply with their request, but there's nothing to be ashamed of in it.—*Honest Miller.*

World's Fair News.

At the last meeting of the directors of the World's Columbian Exposition, the special committee on budget presented its report. The committee had this to say in regard to the location of the entire electrical exhibition at Jackson Park:

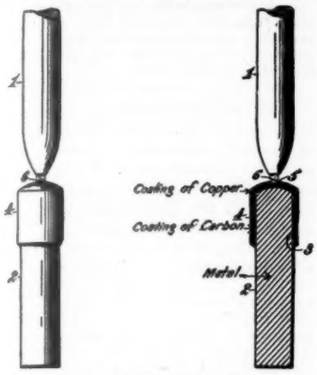
"Your committee believes that electrical displays can be presented with better effect and to the greater satisfaction of the public in a building designed for electrical exhibits at Jackson Park than upon the contracted space on the lake front. This view of the matter is shared by Col. Clowry, chairman of the committee on electrical exhibits, and by other good authorities. Hence the estimates for buildings can be lessened $250,000 in this direction. The director-general estimates over $300,000 for electric plant and lighting on the lake front."

J. Allen Hornsby has been appointed secretary of the electrical bureau by Professor Barrett.

PROGRESSIVE ELECTRICAL INVENTIONS.

ARC LAMP CARBON.

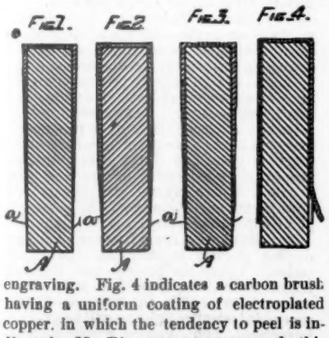
In the accompanying engraving is illustrated an improvement in negative carbons for arc lamps invented by Albert C. Seibold, of Mount Vernon, N. Y. The negative electrode of the lamp is in effect a metallic bar coated with a layer of carbon for about one inch of its length on the upper end, the layer of carbon coating being about one thirty-second of an inch thick. This layer of carbon is indicated by the reference numeral 3 in the diagram. After the coating is formed it is electroplated with a thin layer



of copper, as indicated at 4. In use, after the establishment of the arc, a circular opening, as indicated at 5, about one-eighth of an inch in diameter, is burned through the coating of copper and the carbon exposed, and this is continuously coated by the current, small particles of carbon being deposited from the point of the positive electrode 1. During the passage of the current this deposition continues simultaneously with the consumption, the crust 6 being constantly consumed and constantly renewed. The negative electrode is thus made of very low resistance, the portions of the carbon covered by the copper being protected from the oxidizing action of the air in case it should be heated sufficiently high to be subject to such action; and the negative electrode is rendered very durable, thus not only decreasing the cost of maintenance of the lamps, but occupying less time of the operator in replacing new carbons.

CARBON COMMUTATOR BRUSHES.

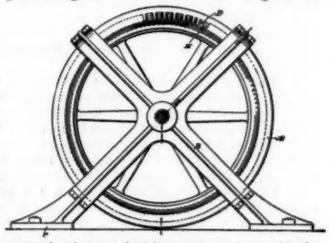
In using carbon commutator brushes the difficulty experienced is that the thin plating of copper near the wearing edge of the brush tends to peel off, forming a rough jagged wearing edge liable to cause short circuits in the machine, poor contacts, and interfering with the freedom of play of the brush in its holder. A remedy for this defect recently patented by E. W. Rice, Jr., of Lynn, Mass., is illustrated in the accompanying



engraving. Fig. 4 indicates a carbon brush having a uniform coating of electroplated copper, in which the tendency to peel is indicated. Mr. Rice proposes to remedy this difficulty by electroplating the deposit of copper of varying thickness, increasing from the contact edge to the outer end of the brush. An increase of thickness may be attained by gradually withdrawing the carbon brush from an electroplating bath, the parts remaining in the bath, of course, receiving a thicker deposit of metal. In Fig. 1, A indicates the brush or carbon and *a* a deposit of copper, the function of which is to reduce the resistance and tendency to heat of the brush. In this figure, as will be seen, the increase in thickness is gradual from one end of the brush to the other. In Figs. 2 and 3, increasing deposits of slightly different grades are indicated, the tendency in all the cases being to give the deposit sufficient stiffness to prevent peeling.

PREVENTING NOISE IN ALTERNATING ARC LAMPS.

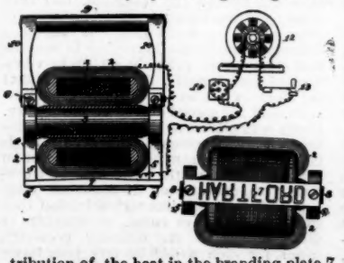
A difficulty experienced in the operation of arc lamps with alternating or pulsating currents, is that a pronounced sound, varying with the rate of the alternations of current, but at all times objectionable and disagreeable, is emitted. Nikola Tesla, of New York, has recently patented a system with a view to overcoming this disagreeable feature. Mr. Tesla thinks the noise is due to the rapidly alternating heating and cooling and consequent expansion and contraction of the gaseous matter forming the arc, and states that it may be abated and a quiet and smoothly acting lamp be produced by increasing the number of alternations of current until the rate of vibration in the arc approximately equals or exceeds that which is generally regarded as the limit of audition. In carrying his method into practice he constructs a generator, a side view of which is illustrated in the accompanying engraving, provided with a very large number of pole-pieces, indicated at D, as many as 375 or 400 poles to the machine. The polarizing coils of the field magnet are



wound zigzag fashion around projecting tongues in an annular field core, and the armature coils are similarly wound upon the periphery of a drum mounted on a spider. At a speed of 1,500 or 1,600 revolutions per minute a rate of alternation is produced having a frequency of 10,000 or 11,000 per second. Under this system it is alleged that the sound produced by the arc becomes practically inaudible.

ELECTRIC BRANDING.

An ingenious application of electric heating to a branding tool has been recently patented by William Cannell, of Hartford, Conn. The device is illustrated in the accompanying engraving, which shows a transformer connected with an alternating current generator, and means for regulating the strength of the alternating current by means of a resistance switch 13 and an adjustable choke-coil 14. The branding device comprises a small transformer provided with a wooden handle 9, 10, the transformer core shown at 1 being made up of a series of laminated iron rings; 2 is the primary coil. The secondary circuit comprises a copper tube 3 provided with a layer of insulating material 4, the tube being connected at its ends with copper bars 5 which are bridged by a bar 7 upon which are the branding letters in relief. Under the influence of the alternating current an induced secondary current of large volume passes through the branding plate 7, which is made of such a cross-section that it will heat under this influence. For the purpose of regulating the dis-



tribution of the heat in the branding plate 7 and of imparting a uniform temperature to the letters or other characters in relief thereon, the plate is made thickest in the middle and its cross-sectional area is made to diminish gradually from the middle to the ends so that all of the letters will be uniformly heated. When the circuit is closed and the apparatus brought to the proper temperature, the brand is applied to the article to be marked in the ordinary manner and the stamp burnt in upon the said article.

Municipal Lighting.

Last week the Massachusetts House Committee on Manufactures began to hear the remonstrance against the municipal ownership of gas and electric light plants. E. W. Burdette, conducting the remonstrants' side of the hearing, said in opening that the companies do not make enormous profits; that, in fact, the companies in most places are just able to make expenses. The companies have taken the risks and given the country the boon of electric lighting. He did not pretend that the companies were opposing the proposition for municipal ownership from any disinterested motives.

The first witness called was M. J. Francisco, of Rutland, Vt., who stated that he had examined electric light companies all over the country. He said that the schedule of cost submitted at a former hearing by the petitioners was taken from a book which has since been repudiated by its author, so far as its figures were concerned. He then presented a series of statements concerning western towns and cities which own their own electric light plants and do their own lighting. These he discussed in detail, as many of them had been cited by Mr. Legate for the petitioners, and endeavored to prove that the figures quoted of the cost are misleading. His statements were based on letters from officials and citizens and on his personal investigations.

Electrical Utilization of Insects.

An electric apparatus supplies a strong light which attracts the insects and moths; a suction fan worked by the electric current draws them in when they approach the light, and carries them into a small mill, also worked by the electric current, where they are ground up and mixed with flour and thus converted into poultry food of excellent quality. This is said to be a Bavarian contrivance.—*Scientific American.*

Messrs. Truex and Vail.

C. R. Truex and W. A. Vail, gentlemen widely known in the telephone and general electrical fields, have formed a co-partnership under the name of Truex & Vail, at 44 Broadway, N. Y. They have secured the exclusive selling rights in New York, New Jersey and additional territory, for the Accumulator Company, of New York, the Electro-Dynamic Company, of Philadelphia, and the Walker Electric Company, of New York.

Their numerous friends in the electrical field will be glad to welcome them, and the REVIEW extends its most sincere well-wishes for the success of these enterprising and thoroughly progressive gentlemen.

A New Electric Hoist.

An electric hoisting and conveying machine, the invention of Ezra Nicholson, of Cleveland, O., has been in operation during the past two weeks in Cleveland, and has been examined by prominent iron ore and coal men and pronounced an unqualified success. The designing and construction of the plant has been in charge of W. P. Williams, a member of the American Society of Civil Engineers. Mr. Williams and Mr. Nicholson have patented several different systems for the hoisting and conveyance of bodies by electricity, and will shortly organize a company to commence the manufacture of plants for coaling terminals and general work. This new invention is claimed to be especially adapted for economic use in loading and unloading vessels or cars of iron ore, coal or general merchandise, and convey the load to any desired point. A 30 horse power Rae electric motor is mounted upon a light tramcar holding suitable hoisting mechanism, and the operator riding on this car hoists the load from any desired point and rapidly conveys it to the place of unloading. The presence of the operator always over his work has a great advantage over steam automatic cable systems in present use.

The present work performed by the plant is unloading a vessel of iron ore, hoisting a load of 3,000 pounds vertically five feet per second, then traveling across a bridge 30 feet high and 200 feet long spanning the ore dock, the cross travel being made in 10 seconds, and the operator stopping the car holding the bucket and dumping the load at any desired point. Systems have been designed for quarry, rolling mill and contractors' use, by Messrs. Nicholson and Williams.

—— Never kick an electric light wire when it is down.—*Buffalo Express.*

—— By a vote of 569 to 92, Fort Dodge, Ia., has decided to purchase and own its own electric light plant.

—— The Pontoosuc Woolen Company, of Pittsfield, Mass., will spend $40,000 in an electric light plant.

—— The Evanston, Ill., Electric Illuminating Company has increased its capital stock from $50,000 to $75,000.

—— The People's Incandescent Electric Light Company, of Meadville, Pa., have declared their first quarterly dividend of one and one-quarter per cent.

—— Under a suspension of the rule, the Massachusetts House admitted the petition of the Wakefield selectmen for authority to manufacture gas or electricity.

—— The Builders' and Traders' Exchange, of Kansas City, Mo., wants better electric light wiring in the office buildings of the city, and to that end that organization is about to ask of the city an electric wire inspector.

—— The strike at the Corning Glass Works in New York has caused considerable interference in the incandescent light department of the Thomson-Houston Electric Light Company, at Lynn, Mass. The result will probably be the erection of a glass-blowing factory by the Thomson-Houston Company.

—— The American Electric and Manufacturing Company, successor of the American Telephone Company, Consolidated, have just closed a contract with the Thomson-Houston International Electric Company, of Boston, for an incandescent plant of 650 lights at Valencia, Venezuela. The company already have an arc light plant, lighting the streets of Valencia under a 10 year contract.

—— The Western Isolated Lighting Department of the Thomson-Houston Electric Company report the following recent sales: Calumet Distilling Company, New Chicago, Ill., 200 light incandescent plant (increase); Bradner, Smith & Company, Chicago, 20 arc light plant (increase); Woodcock & Loring, Clifton House, Chicago, 12 arc light plant; Liss & Rickeman, 75 North Clark street, Chicago, 120 light incandescent plant; D. B. Fisk & Company, Wabash avenue and Washington street, Chicago, 35 arc light plant and 250 incandescent lights.

—— At the annual meeting of the Fall River, Mass., Electric Lighting Company, the treasurer's report showed that the total assets of the company were $124,743.11; capital stock, $102,200; accounts payable $20,739.87; profit and loss, $1,803.24. The total receipts for the year were $31,989.88; expenditures, $24,118.94; net profits, $7,870.94. There were paid in dividends $5,850. The following officers were chosen: President, Frank S. Stevens; clerk and treasurer, Owen Durfee; directors, Frank S. Stevens, J. D. Flint, W. H. Hathaway, E. L. Anthony, F. O. Dodge, O. S. Hawes.

—— The Lewiston *Journal* makes the statement that electricity is making itself felt in Bangor, Me., not only among the dealers of kerosene lamps and chimneys, but in the business of the gas light company there. This latter has an extensive plant with the city well piped, but for three years gas has been steadily on the decrease. To compete with the electric fluid, the gas company has reduced its rate first from $2.50 per 1,000 feet to $1.98 net, and at the end of this quarter it will be announced the price for a first-class article in gas will be $1.80 per 1,000. The city lights the streets in an unexcelled manner, and to-day there are 1,969 incandescent and 84 arc lights furnished by the electric light and power company from the Veazie plant, four miles up river, and run by water-power.

On Change of Form Affecting a Magnetic Field.

A PAPER READ BEFORE THE AMERICAN ACADEMY OF ARTS AND SCIENCES, JANUARY 14, 1891, BY PROF. A. E. DOLBEAR.

Hitherto, the study of a magnetic field has been the study of the so-called lines of force radiating from the poles of magnets, either electro or permanent; and, so far as magnetism has been utilized in the arts, the changes in this external field have been brought about by the movements of an armature, having for its function to determine the direction and consequent density of the field. Such is the case in the instruments used in the telegraph, the telephone, in dynamos, and in motors. Sometimes, conducting wires are so mounted in the field that their movement gives rise to electric currents; which signifies that the energy producing the tension in the field is absorbed in some measure by the moving wires, and is transformed into an electric current. In each of these cases the magnet producing the field is stationary; that is, changes in the magnetic field produced by it are due to a motion external to the magnet itself, and may be that of an armature, of a moving wire, or of its own bodily change of position—a kind which is comparable with what is called external motion in thermodynamics, to distinguish it from internal motions, or such as take place when the body changes its form. So far as I am aware, no study has been made of the effect of changing the form of a magnetic body on its field, or of the reaction upon itself of its magnetic condition due to a periodic change of form. Of course, it has been known for a long time that the form of the magnetic field depended upon the form of the magnet itself. For a straight bar magnet, this field is familiarly known by the arrangement of iron filings forming curved lines from each pole re-entering the opposite pole. When the iron is bent into a U-form, or horseshoe magnet, the field is mostly contracted to the space between the poles. These forms of magnets have been *permanent* ones for the purpose for which the magnet was made.

In the case of induction coils, whether of one form or another, the magnetic change produced by it has been and is due to the *electric* change produced upon it by an electric circuit provided with intermittent or alternating currents.

Within a few years, attention has been called to the nature of the external field, as being a part of what is now known as the magnetic circuit, which consists of these *rings* or closed circuits of lines of force, all originating in the iron part of the circuit, and for *conducting* which iron is by far the best. The poles of the magnet are simply the parts of the iron where the lines enter and leave, and they may be in any place. Usually, they are at the ends of the iron, but not necessarily so. Whenever iron is placed in the magnetic field, these lines crowd into it, as it is a much better conductor than the ether. When the iron is made into a ring form and then magnetized, there is no external polarity, and, consequently, no external field, provided that the iron has sufficient conducting cross section at every part.

The following experiments have been tried to determine what effects, if any, are produced upon a magnetic field by changing the form of the magnet. It was thought, at first, that if a helix was coiled into a circle, and a current was present in it, changes in its form would produce corresponding changes in the magnetic field external to the coil, especially noticeable if a flexible iron ring was enclosed in the helix so as to condense the magnetic field. This was put to the test in the following manner:

1. A coil, similar to the one described above, but containing a solid ring of iron, about eight inches in diameter and an inch thick, had its coil put in circuit with a reflecting galvanometer of low resistance, and at such a distance from it that magnetic fields external to its circuit could not act upon it. Another coil made about a flexible ring of iron wire, was put in circuit with a battery so as to magnetize the ring strongly. Then, with one ring parallel to the other, the flexible one was made suddenly to assume an elliptical form. Each such change in form, from one ellipse to another at right angles to it, gave a deflection of the needle to the right or left, and uniformly for a given phase of change. It was also observed that the direction of the deflection was reversed when the flexible ring was turned the other side up.

2. The same flexible ring, used in the same way, but without the current through it, gave substantially the same results. Of course, the ring was permanently magnetized, and the change might have been inferred.

3. As the same kind of motion, due to change of form, is taking place when a ring is vibrating at its harmonic rate, producing what we call sound vibrations, it was thought probable that a magnetized ring, having a coil of wire about it in connection with a telephone, would send up vibratory currents when it was struck; and this was found to be true, for when the coil containing the heavy iron core was put in circuit with a telephone in another room, the sound of the stroke and the pitch of the ring could plainly be heard. In the first case, the number of turns of wire was small, perhaps 50 or thereabouts. I, therefore, had two larger rings made, each about one foot in diameter and half an inch thick.

4. One of these was wound with six or seven hundred turns of No. 32 wire. Before it was magnetized, it was connected with the telephone, and tested for its magnetic condition by striking. The ring could plainly be heard, which showed that it had some degree of magnetism.

5. Then about 200 turns of coarse wire were wound upon it, and a strong current sent through it to magnetize it. After this magnetizing coil had been removed, the ring was again tested as in 4. The sound was very much louder. Indeed, the telephone could be held a foot from the ear and be heard.

6. With the ring in 5 still in circuit, the companion ring, without any wire upon it, was brought near it and struck. The sound was easily heard in the telephone circuit.

7. This second ring was now magnetized in the same way as the first, when the magnetizing helix was removed, and experiment 6 repeated. The sound was *very* much louder.

8. The ring was now struck and moved away from the first ring by stages of an inch or two at a time. It was found possible to hear its pitch in the second circuit when it was a yard or more away from it.

9. As the pitch of the two rings was not quite the same, the higher one was loaded so as to bring them to unison. The sound was then louder and more persistent than before. This gave evidence that it was of sympathetic vibration, while the former were forced vibrations.

10. A common horseshoe permanent magnet, with legs about six inches long, had, perhaps, 50 ohms of No. 32 wire wound about the bend, and this was put in circuit with the telephone and struck like a tuning fork. The sound in the telephone was remarkably loud; indeed, too strong to be held comfortably at the ear.

11. A coil of wire was now put about the middle of a piece of gas pipe, which was without permanent magnetism. The piece of pipe was about four feet long and about five-eighths of an inch in diameter. This, when in connection with the telephone, was struck two or three times a second with a piece of brass rod, and while being thus struck it was rotated from the magnetic meridian to a position at right angles to it. The difference in the loudness of the sound, between the position in the meridian and away from it, was very marked. It is, therefore, shown to be possible to determine the points of the compass with a telephone, a coil and an iron rod.

12. A second flexible ring was now made, about a foot in diameter, consisting of a bundle of soft iron wire, the ends being roughly braided and twisted together; the thickness of this was rather less than half an inch. This was covered by a rubber tape wound spirally round it, the better to secure stability of form and insulation. Then 4.6 ohms of No. 21 wire were wound about its entire length, making probably 1,000 turns. It was then magnetized by a current from three secondary cells having six volts, giving a magnetizing current of about 1,300 ampere turns, leaving it a ring magnet. The terminals were then connected with the terminals of a reflecting galvanometer with a resistance of .67 ohm. Very slight changes in the form of the ring, either by pulling or pushing, gave decided movements to the needle, while larger amplitude gave 30 to 40 degrees deflection.

13. It was noticed, also, that the direction of the current depended, not only upon the direction of the motion changing the form, but also upon the direction of the motion with reference to the normal shape of the ring. Thus, if the ring be a circle, and it be drawn into a horizontal ellipse, the current will move the galvanometer needle, say, to the right. When it is brought back to the circular form, the current is reversed. If the motion be continued so as to produce a vertical ellipse, the current will be in the same direction as that produced at first by a motion exactly opposite in direction, so that for a complete cycle of vibratory changes four currents are generated, two direct and two reverse.

14. One of the iron rings before mentioned, a heavy one about eight inches in diameter and an inch and a half thick, having coarse wire wound upon it nearly covering the ring, was covered with the galvanometer as before, and the ring was struck by a brass rod. The needle instantly swung through a wide angle. Struck again, it moved as before, but not through so wide an angle, and a half-dozen blows knocked nearly all the magnetism out of the ring. This was then detached from the galvanometer and magnetized as before, when it again gave the same large deflection it gave at first. The same conditions were tried with other rings, and in each case it was found that a vigorous stroke upon the ring magnet had the same destroying effect upon the magnetism as it is known to have upon magnets having external fields.

15. The flexible ring was now put in circuit again, and vigorously jerked with the hands. A very few such movements served to destroy nearly all the magnetism present, requiring the remagnetization of the ring.

As flexible iron rings such as I wanted were not easy to make, I procured some steel wire rope of the right size, and the ends were welded for me through the courtesy of Professor Elihu Thomson, of Lynn, by his electrical welding process. Such a ring about a foot in diameter allows a movement of five or six inches to one of its sides. This when wound with four or five hundred turns of No. 22 wire may be magnetically saturated by sending a current through the wire, leaving the ring charged. The terminals may now be connected with a proper galvanometer, and changes in the form will discharge the ring.

These experiments prove:

1. That a change in the form of a magnet causes a corresponding change of stress in the field.

2. That periodic changes in form, due to elasticity of form, such as are called sound vibrations, set up similar periodic changes or waves in the magnetic field.

3. That such sound vibrations of a magnet act upon other magnets like sound vibrations, and set them into corresponding vibratory movements, sympathetic or forced; sympathetic when the receiving magnet has the same pitch as the transmitting magnet, and forced when it has not the same pitch.

4. That such sound vibrations in the receiving magnet cause a corresponding change of form in its magnetic field, which manifests itself by electric currents in circuits surrounding it.

Sir William Thomson has frequently said that he could understand a mechanical idea when he could make a model of it, but could not otherwise. If one assumes that the ultimate atoms of iron are magnets, as is thought most probable now, or holds, by Ampere's hypothesis, that currents of electricity circulate about each atom, making it a magnet—in either case, each individual atom has its own magnetic field, which is, necessarily, always with it. It is really its reaction upon the ether. If such atoms be elastic, as there is the best of reasons for believing, then it follows that impact must set them into periodic vibratory motion, that is, periodic change of form at a rate depending upon its degree of density and elasticity. Such changes of form set up corresponding periodic waves in the ether, as changes in the magnetic field, and these are transmitted outwards with a rate depending upon the properties of the ether to transmit such motions, not upon the source of the disturbance.

Such vibratory motions among atoms and molecules we call heat, and such periodic waves in the ether we call light, and thus Maxwell's idea of light being an electro-magnetic phenomenon is altogether in accordance with the experiments. For waves of the lengths of light waves, it is essential that the vibrating body be small and highly elastic. Maxwell's idea was, that the opposite phases of ether waves could produce opposite electrical effects, so that each half-vibration represented either positive or negative conditions; and these implied, though I have not noticed the statement, that they must have originated with vibrating magnetic atoms or molecules. It has been difficult or impossible heretofore to imagine how ether waves could be set up by vibrations of the elements, though the idea that the atoms of matter are magnets is not new at all, and has a good degree of probability. If one is to picture to himself at all how this kind of a phenomenon can occur, he is bound to have in mind some form for an atom that shall at the same time be a consistent magnetic form. If atoms are magnets, it is wellnigh inconceivable, that they should be spheres or cubes, or tetrahedra or disks, or any of the ordinary geometric forms, for such would be very poor forms to exhibit magnetic properties. But a ring presents a very different case, as a ring magnet is the most perfect form possible. There is this to be said of such a form, however. It does not present what we commonly call a magnetic field; it is a closed circuit. Nevertheless, I would ask if it is probable that the ether external to a magnet of that form should be quite unaffected, quite neutral? I should suppose not, but, on the contrary, should look for some sort of stress there, though it might be of somewhat different nature, and have somewhat different properties, from an ordinary magnetic field. But if such were the case, it follows that any magnetic change in the ring magnet itself would be followed by a corresponding change in the external field, and vibratory motions would necessarily set up waves in that field. Such waves would have a magnetic origin, but the waves themselves would not necessarily give rise to electro-magnetic effects directly. Indirectly they would, for if they could make another similar magnet vibrate sympathetically, these vibrations would react upon its magnetic properties.

Such a ring form as I have shown suggests at once the vortex ring theory of atoms, of the properties of which I have so often spoken to the Academy. Perhaps the experiments should have a different interpretation from that suggested here, but whatever their interpretation may be, they are believed to be entirely new, and, therefore, of interest, if not important.

FOREIGN ELECTRICAL NOTES.

The use of the telephone for the hearing of theatrical performances is meeting with continued success in Paris. There are now over 30 different clubs, hotels and cafés connected with the Theatrephone Company's lines, and others are daily joining.

Mr. Julien, who has successfully formed several companies in the United States and the Brazils, for working his patents relating to electric traction and accumulators, is, says *Industries*, on the point of forming a company in Paris for the same purpose. This may give an impulse to the use of electricity as a tractive power in Paris, where, up to the present, this method has been but little employed.

The following statistics have been collected by the Berlin Electricity Works with reference to the progress of electric lighting in Berlin, including the lights served by its own system and by other installations, the numbers being taken on the 1st of April, each year:

	1889.	1890.	Increase in 1889-1890.
Arc lamps	3,778	4,944	1,166
Incandescent lamps	62,876	80,788	17,912

Of this number, the Berlin Electricity Works supplied the following proportion by means of their central stations:

Arc lamps for private and public lighting	970	1,832	862
Incandescent lamps	31,417	43,215	11,798

The remaining 3,112 arc lamps and 37,573 incandescent lamps were supplied from 262 installations, for which the motive power is given by steam and gas engines as follows:

Steam engines	188	171	13
Gas engines	79	91	12

The five arc lamps and 6,163 incandescent lamps in the two Royal theatres are included in the number given as supplied by the Electricity Company. On the supposition that one arc lamp is equal to six incandescent lamps, and each incandescent lamp is equal to one gas lamp, the total number of electric lamps on the 1st of April, 1890, gave light equal to 110,452 gas lamps, of which 54,207 was the amount supplied by the Berlin Electricity Works, and 56,245 by private installations. The total number of electric lamps at the end of the working year, as reckoned on the above supposition, showed an increase of 29 per cent. over the previous year, whilst the electrical works showed an increase of 46 per cent., and private installations of 16 per cent. The district hitherto lighted by the electrical works is one of the most favorable in Berlin, since it includes many important business establishments, the Royal theatres and bank premises, as well as large private houses, to the owners of which cost of lighting is of small importance. Notwithstanding the extension of electric lighting in this district, there has been an increased use of gas during the past year, and if the same proportion should be maintained in the two other districts, where central stations are to be opened, an enlargement of the gas works' plant will be necessary.

The Hungarian State Railways are introducing electric lighting on the express trains. Up to the present time eight carriages have been provided with Tudor accumulators, and if the trial should prove successful, electric lighting will be generally introduced. The Vienna Stock Exchange and the larger railway stations have been recently lighted electrically.

The use of the telephone is being extended to all parts of Sweden, and it is now proposed to connect several places in the Bohnslön Stargard by submarine telephone cables. This installation will probably be undertaken by the State Telephone Administration.

Hammerfest, the most northerly town in Europe, is the first town in Norway to be lighted completely by electricity. The Thomson-Houston system is used and the motive power is supplied by a waterfall at about a mile distance. The installation is satisfactory, and will be extended so as to light the harbor.

Great Electrical Business of a Great Company.

The Thomson-Houston Electric Company has just closed a contract for 40 additional cars with the Cincinnati Street Railway Co., of Cincinnati, O., and for six cars with the Pueblo City Railway Co., of Pueblo, Colo.

During the recent snowstorm in Denver, Colo., there was not one cable line in operation, while the Thomson-Houston electric cars were operated without the slightest difficulty. The Denver Tramway Co. has decided to abandon the Eighteenth street cable and use electricity as a means of car propulsion.

The Thomson-Houston Electric Company has also closed contracts with the Rock Creek Railway, Washington, D. C., for 12 cars; Harrisburg City Passenger Railway, Harrisburg, Pa., 14 cars; City Electric Railway, Little Rock, Ark., 28 cars; Jefferson Avenue Railway, St. Louis, Mo., 25 cars; Oxford Lake Line, Armiston, Ala., 6 cars; Allentown and Bethlehem Rapid Transit Co., Allentown, Pa., 15 cars; Marquette City and Presque Isle Co., Marquette, Mich., 3 cars; Braddock and Turtle Creek Railway, Braddock, Pa., 3 cars; Salt Lake Rapid Transit Co., Salt Lake City, Utah, 3 cars; Buffalo Street Railway Co., Buffalo, N. Y., 12 cars; Pittsburgh and Birmingham, 2 cars (making the fourth Thomson-Houston electric railway in Pittsburgh, Pa.); Troy and Alpia Street Railway, Troy, N. Y., 20 cars; St. Louis and Suburban Street Railway Co., St. Louis, Mo., 45 cars; Chattanooga and North Side Railway, Chattanooga, Tenn., 4 cars.

The Thomson-Houston Electric Company reports the sale of the following apparatus:

ARC APPARATUS.

Ashland, O., 50; Lowell, Mich., 50; Mansfield, Pa., 25; City of Chicago, Ill., 50; Elyna, O., 70; Louisville, Ky., 50; South Chicago, Ill., 150; Greenville, Mich., 60; Lincoln, Neb., 150; Newport, Ark., 50; Joliet, Ill., 150; Arkadelphia, Kan., 30; Medina, N. Y., 50; Olathe, Kan., 50; Parsons, Kan., 35; Hyde Park, Ill., 50; Clinton, Mo., 50; Shelbyville, Mo., 50; Oshkosh, Wis., 50; Harrison, O., 35; Osage, Ia., 18; Farmville, Va., 30.

INCANDESCENT APPARATUS.

Quincy, Ill., 1,300; Monroe, Wis., 1,300; Moosie, Pa., 300; Morristown, Tenn., 650; White River Junction, Vt., 650; Arkadelphia, Kan., 650; Olathe, Kan., 650; Pella, Ia., 650; Waterville, Conn., 1,300; Charleston, W. Va., 1,300; Babylon, L. I., 650; Clinton, Mo., 500; Boston, Mass., 650; Chelsea, Mass., 1,300; Harrison, O., 650; Huntington, Ind., 650; Port Huron, Mich, 1,300; Tuscola, Ill., 500; Worcester, Mass., 1,950; Paw Paw, Mich., 300; Edinburg, Ill., 300; Bennington, Vt., 1,300; Omaha, Neb., 1,300; New Albany, N. Y., 650; Greenville, Mich., 650; Virginia City., Nev., 650; Farmville, Va., 300; Mt. Vernon, N. Y., 1,300; West Superior, Wis., 1,300.

ISOLATED PLANTS—ARC APPARATUS.

Schlitz Brewing Co., Chicago, Ill., 6; Alger, Smith & Co., Black River, Mich., 30; J. P. Craig, Memphis, Mo., 30; Glenwood Co., Yonkers, N. Y., 9; Sanderson & Sons, New York, N. Y., 30; Central Iron Works, Harrisburg, Pa., 50; Bradner, Smith & Co., Chicago, Ill., 20; Woodcock & Loring, Chicago, Ill., 12; D. B. Fiske & Co., Chicago, Ill., 35.

ISOLATED PLANTS—INCANDESCENT APPARATUS.

Warden Apartment House, Philadelphia, Pa., 1,600; Tuscaroras Advertising Co., Coshockton, O., 100; Baackus Wire Nail Co., Cleveland, O., 400; Read House, Chattanooga, Tenn., 600; Hotel Oglethorpe, Brunswick, Ga., 150; Deloach Mill Manufacturing Co., Atlanta, Ga., 100; National Distilling Co., Milwaukee, Wis., 100; St. Louis Railway Co., St. Louis, Mo., 200; A. Zeese, Chicago, Ill., 100; Lane Bros., Newark, O., 150; C. E. Harwood, Lynn., Mass., 150; G. A. Robertson & Co., Hinsdale, N. H., 50; Brooks' Bank Note & Lith. Co., Boston, Mass., 100; Orr & Strettle, Pigua, O., 600; Piedmont Bath and Power Co., Oakland, Cal., 500; Fitchburg Manufacturing Co., Fitchburg, Mass., 200; Calumet Distilling Co., New Chicago, Ill., 450; H. C. F. Koch, New York, N. Y., 1,200; New York Jockey Club, New York, N. Y., 800; Liss & Rickerman, Chicago, Ill., 100; D. B. Fiske & Co., Chicago, Ill., 250; Walter Aiken, Franklin Falls, N. Y., 100; Clark's Hotel, Boston, Mass., 150; Monmouth Park Hotel, Little Silver Station, N. Y., 800; Wm. Ruehl Brewing Co., Chicago, Ill., 200; E. Richards & Son, Sandy Hill, N.Y., 100; Jordan & Stewart, Oldtown, Me., 50; Newmarket Manufacturing Co., Newmarket, N. H., 400; E. P. Parksons & Co., Tilton, N. H., 200; American Scotch Iron Co., Syracuse, N. Y., 50; E. Frank Lewis, Lawrence, Mass., 100; American Tin & Lead Co., Canon City, Colo., 200; Fairchild Paper Co., East Pepperill, Mass., 200; Gouverneur Wood Pulp Manufacturing Co., Gouverneur, N. Y., 50; Lockport Pulp Co., Lockport, N. Y., 200; North New York Marble Co., Governeur, N. Y., 50; Allen Bros. & Co., Sandy Hill, N. Y., 400; Walter M. Lowney, Boston, Mass., 200; Clarendon Hotel, Brooklyn, N. Y., 400.

Figures Relating to Electric Traction.

In a recent issue of London *Engineering*, the following communication is published:

In your able article on "The Electric Transmission of Power," referring to the electric cars at Barking road, it is stated that the "haulage expenses are about 8*d.* or 3*d.* more than horseflesh." Will you allow me to point out that in the 8*d.* are included the wages of the drivers, and that there is no tramway in the kingdom where the haulage cost is 5*d.* inclusive of driver, and indeed there are not half a dozen lines where this sum covers the "horsing" pure and simple per car mile. In very many instances it amounts to 6*d.*, exclusive of driver's wages. Mr. Kapp's table refers to an annual duty of only 100,844 car miles, which represents the work of four cars running at the usual rate and time of ordinary horse cars. This enterprise, being so limited in extent, it is hardly fair to conclude that the figures given will be reached in the case of more extensive applications. I do not wish to bring forward any hypothetical estimates, and I will confine myself to such figures which can easily be proved. It is a fact that a well-constructed car of 10 tons weight, running at the rate of seven miles an hour, on ordinary tram lines, consumes energy at the rate of from five to six electrical horse-power at the motor terminals. In the case of storage batteries we require at the worst 10 indicated horse-power at the depot to drive the charging dynamo. The steam engine, when charging cells, will run with a practically constant load, therefore, at its highest efficiency. It is admitted that in large economical engines the energy can be produced for £10 per horse-power per annum, or 2,400*d.* for 3,000 horse-power hours, including cost of fuel, attendance, repairs and all necessary items. Allowing for all possible losses, we find, in practice, that 1.25 horse-power hours, given off by the steam engine, is sufficient to propel the car one mile over an average road with the usual frequent stoppages. At this rate the cost of steam power amounts to 1*d.* per car mile. Thus leaving all the items as they stand in the table, published in your esteemed journal, but substituting 1*d.* for steam power and 5*d.* for the attendance other than engine drivers and stokers, and deducting the car driver's wages, we obtain 5.5*d.* for the traction expenses. But the rates at which the motors and gearing depreciate, according to the Barking road table, appear very high. The deprecintion of accumulators also is enormous, viz., 2.818*d.* per car mile; this can easily be reduced to 1*d.* and leave the contractor for repairs and renewals a fair profit.

There are many electric tramways where the traction expenses are less than 3*d.* per car mile; tramways, of course, where overhead, underground or other conductors are used. The last report of the Portrush Tramway Company shows that the cost of traction with the electric cars was 3½*d.* per car mile, and then the traffic is not at all favorable to high efficiency. The Blackpool line can show even better results; the same may be said of the Frankfort-Offenbach line, the Moedling line, and others which have been working for five or six years, and where all the items of repairs are well known and carefully recorded. There is no reason whatever why, in large systems of tramways, electric traction should cost more than 3*d.* per car mile with conductors, or more than 4*d.* with accumulator cars. The practical data at our disposal is now sufficiently great that we need no longer estimate with unknown quantities. I find that the energy per car mile consumed at the depot is practically the same whether it is sent through accumulators or through conductors. The contractors for power for the City and South London Electric Railway charge the company 3½*d.* per train mile, each train consisting of an engine and three large cars. I do not know whether it pays them to do so, but it is scarcely probable that they will lose much by this bargain. Mr. Kapp has published the figures in a form which is calculated to mislead the uninitiated.

Yours respectfully,
London, Feb. 24. A. RECKENZAUN.

New Use for Electricity.

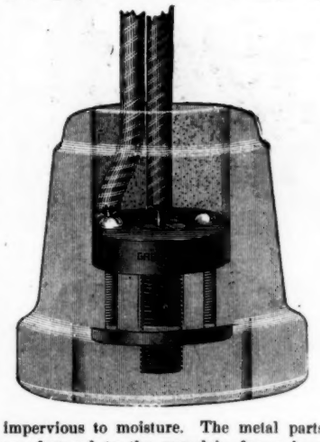
On Tuesday afternoon a middle-aged man entered the office of the Pittsfield, Mass., electric light station on business bent, says the *Journal*, of that city. He produced a quart bottle and asked to have it filled with electricity. The genial manager of the concern soon discovered that the purchaser was in dead earnest, and further questioning revealed to this electrician, always on the alert for something new in his line, that the middle-aged man aforesaid had discovered a new use for the mysterious, and, as Webster calls it, "subtle fluid." He with the bottle went on to explain that he had been told it was the best remedy known to remove lice from cattle, and that it could be bought in Pittsfield at the electric station for six cents a gallon. He only wanted a quart of it and was anxious to get it and be off. He was finally convinced that he had been imposed upon, but did not express himself upon the subject of practical jokes. It is understood that the imposee has left Pittsfield.

This is the best electrical joke since that of last week, when one Pittsfield paper, speaking of electric railways, told the difference between the single and double trolley systems. It said the single trolley had one wire in the middle of the street while the double trolley had a wire each side of the street.

A New Waterproof Socket.

A thoroughly waterproof socket, which we illustrate herein and which seems to leave nothing further to be desired in the way of a fixture of this kind, is being introduced by The E. S. Greeley & Company, of New York. It is the invention of a practical as well as a theoretical electrician, whose name the socket bears, it being called the Cartwright waterproof socket, and has the following distinct features which show the close attention to details that are necessary to produce an article of merit that will warrant the confidence of those upon whom the responsibility of installation of incandescent plants falls.

The porcelain which forms the shell is a thoroughly vitrified substance, completely



impervious to moisture. The metal parts are fastened to the porcelain frame in a workmanlike manner, and do not depend for their security upon the sealing compound. The sealing compound is said to be of a quality that will stand a zero temperature without deteriorating, and at the same time will admit of the heat that results from a three ampere lamp without softening.

When it is considered that the device is designed simply to meet the requirements of lamps of one-half to one ampere capacity, the large margin allowed will be better appreciated.

The Cartwright waterproof socket is made in three patterns to accommodate lamps of the Edison, Thomson-Houston and Westinghouse types. They are made, as shown in illustration, with rubber insulated terminal wires projecting several inches from the shell to admit of rod connections.

Copper in 1891.

James Lewis & Sons, of Liverpool, who are regarded as the authorities on copper statistics, in a recent communication to the trade, declared that the value of copper during this year will depend mainly upon the extent of the supplies received from the United States. Last year the increased production from this country was 17,000 tons of copper—6,000 from Lake Superior, 1,600 from Arizona, 8,000 from Montana and 400 from other States—but the consumption increased 20,000 tons. It is reasonable to presume that the consumption of copper during the present year will show a considerable increase on that of 1890. With the constantly increasing use of electricity, it is estimated that at least 50,000 tons more copper will be required in England and France during this year. From this it would appear that the copper producers of the United States have every indication of a prosperous year before them.—*American Manufacturer.*

ELECTRIC CLUBS.

New York Electric Club.

Recent Out-of-Town Visitors were: J. O. Hanon, San Francisco; Benjamin F. Stacey, E. H. Noble and James L. Hillard, Boston; Allen R. Foote, Washington; E. F. Smith, Philadelphia; W. H. McKinlock, Chicago; E. F. Spaulding, Bridgeport, Conn.; A. D. Teasdel, Salt Lake City; Henry W. Chase, Boston; George Barton Muldaur, Elizabeth, N. J.; E. O. Zuretusch, Berlin, Germany; Jno. Nicoll, Rochester, N. Y.; Dr. Heraeus, Hanau, Germany; W. A. Stem, Philadelphia.

A Distinguished party of Canadian gentlemen visited the Club last week as the guests of Mr. W. J. Morrison. The party included C. Aime Dugos, police magistrate of Montreal; L. A. Lesage, Jos. Lajois and Albert J. Corriveau, all of Montreal, and Hugh H. McLean, of St. John, N. B.

California Electrical Society.

The California Electrical Society, of San Francisco, held a meeting March 2 to elect officers for the ensuing year. The following were chosen: President, W. C. Quimby; vice-president, Orion Brooks; treasurer, W. G. Crossett; secretary, C. E. Purington. Other members of the executive committee, N. S. Keith, E. A. Roe, W. W. Hanscom.

Chicago Electric Club.

The Following Communication was placed before the Club, at a meeting held March 2:

BUREAU OF ELECTRICITY,
March 2, 1891.

FRANKLIN G. BEACH, President Chicago Electric Club.

Dear Sir—I have been asked by the construction department of the World's Columbian Exposition to appoint for service in that department an electrician competent to undertake an advisory duty on the staff of the chief of construction of the exposition.

This man will be assigned to duty in the office of the architect. The salary of the electrician has been fixed at $2,000 per annum. Recognizing the prominence of the Club and the efficient aid I have received from it and its members, I desire to, in a small way, reciprocate by asking that the Club, at its meeting to be held this evening, agree upon the names of electricians, say three or five, from which I can select this officer of the World's Fair. I shall take pleasure in giving precedence to the names the Club shall submit.

Very respectfully,
J. P. BARRETT,
Chief of the Bureau of Electricity.

The following reply was sent:

CHICAGO ELECTRIC CLUB,
March 2, 1891.

PROF. JOHN P. BARRETT, Chief of Bureau of Electricity, World's Columbian Exposition.

Dear Sir—I have the honor to report that, at a regular meeting of the Chicago Electric Club, held March 2, 1891, your communication, requesting the nomination of three or five electricians from whom to select an electrician to act in an advisory capacity in the office of the architect, was read, and the following nominations were unanimously made: George Cutter, Frederick Sargent, F. H. Soden, Thomas G. Grier, George H. Bliss.

The Club desires to thank you for your courtesy in asking for its co-operation in this matter. Yours respectfully,

F. G. BEACH,
President.
F. W. HORNE,
Acting Secretary.

Messrs. Grier, Bliss and Cutter afterwards withdrew their names, leaving Messrs. Sargent and Soden as candidates. Professor Barrett added the names of Lee L. Summers and C. C. Haskins. These four names were submitted to the directors of the World's Fair, who selected Mr. Frederick Sargent.

Mr. Sargent is an English engineer of considerable experience. He has been connected with several of the large American electrical companies in a professional capacity, but is now an independent electrical engineer, bound to no one interest. His appointment creates general satisfaction, and we congratulate Mr. Sargent.

New York Electrical Society.

The Next Meeting of this Society will be held March 27, at the Club house of the Electric Club. Mr. Joseph Wetzler, editor *Electrical Engineer*, will deliver the address.

KINDRED INTERESTS

Taylor & Son, 39 Dey street, New York city, report increasing sales of the Taylor primary battery.

The Elektron Manufacturing Company, 79 and 81 Washington street, Brooklyn, have installed a large Perret electric motor plant for driving the presses of the Lancaster, Pa., *New Era*.

Chas. A. Schieren & Company, 45 to 51 Ferry street, New York, have sent us a well printed little pamphlet called "What They Say of Our Patent Perforated Electric Leather Belting." It is of a handy size and contains matter which makes it handy for reference.

The Joseph Dixon Crucible Company, of Jersey City, N. J., on April 1, will begin the erection of new and handsome offices, three stories high, on a newly purchased lot, 100x25. They are in the market for improved equipments that will increase office convenience and generally facilitate their enormous and rapidly growing business. Their present offices will be used for factory purposes together with a new addition, 100x100, four stories high.

The Trans-Missouri Electrical Construction and Heating Company, of Lincoln, Neb., are arranging to introduce a new system of electric heating on the Pearson system, for which patents are now pending. The company has just completed electric roads at Lincoln, Beatrice and Grand Island, Neb., all using the Baxter system. This company is composed of G. W. Enslow, president; G. W. Hartman, secretary and treasurer; and F. J. Pearson, general manager and electrician.

The Eureka Tempered Copper Company, North East, Pa., have received the following:

PHILADELPHIA, Feb. 14, 1891.
EUREKA TEMPERED COPPER CO.,
North East, Pa.

Gentlemen: We have your favor of the 7th inst., and in reply would say, we have been using your brushes for some time past and find them very satisfactory.

Yours truly, HENRY WARDEN.

The Central Electric Company, Chicago, are in a receipt of a letter from J. Parker & Son, Chicago, in which they state that they have had three Burnley Dry Batteries in constant use for two years, and they have been successfully operating six three inch bells, which upon a test recently made, were working as satisfactorily as when first putin. They report the largest sales yet recorded on this battery during the month of February. The orders for the improved Candee line wire, as recently received by the Central Electric Company, have taxed their unequalled facilities for handling a large business to the utmost and they have drawn on the factory's capacity to keep supplied with all sizes in anticipation of the Spring business, and are now, as usual, fully stocked.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON MARCH 3, 1891.

447,702 Electrode for electric arc lamps; Albert C. Seibold, Mount Vernon, N. Y.

447,704 Electric motor; Robt. W. Traylor, Richmond, Va., assignor to the Traylor Electric Co., same place.

447,728 Electric snap switch; Gerald W. Hart, Kansas City, Mo., assignor of one-half to Geo. S. Hegeman, same place.

447,734 Electric motor; Emil B. Meyrowitz, Ridgefield, N. J., and Ferdinand Buchhop, New York, N. Y.; said Buchhop assignor to said Meyrowitz.

447,746 Electric arc lamp; Luther H. Buchanan, Pasadena, assignor of one-half to J. De Barth Shorb, San Gabriel, Cal.

447,748 Electrical door bell pull; Lewis W. Cleveland, Portland, Me., assignor of three-fourths to Clarence L. Marston, Lewis A. Barker and Dennis A. Meaher, all of same place.

ISSUED MARCH 10, 1891.

447,767 Electric arc lamp; Henry C. Ferguson, Oakland, Cal., assignor of one-half to H. G. Comstock, same place.

447,768 Combined annunciator and telephone system; John C. Francis, New York, N. Y., assignor to Elias M. Greene, same place.

447,784 Electric switch; John M. Orford, Bridgeport, and John C. English, New Haven, Conn.

447,826 Electric switch and cut-out. 447,827 Electric starting switch; William Hochhausen, Brooklyn, N. Y.

447,832 Electric light fixtures; Joseph Kintz, Ballard Vale, Mass., assignor of one-half to the Craighead & Kintz Co., New York, N. Y.

447,833 Coupling for electric wires; Climpson M. Knight and Thos. Hawken, Salem, Mass.

447,858 Induction preventive for telephone; Thos. F. Wright and Ed. G. Wilson, Chicago, Ill.

447,861 Conduit for electric wiring in buildings; Sigmund Bergmann, New York, N. Y.

447,867 Electric switch; Horace T. Clark, Bridgeport, Conn.

447,885 Trolley carriage and conductor; Chas. J. Luce, Niantic, Conn.

447,889 Hanging and adjusting device for cords; James A. Matteson, River Point, R. I., assignor of one third to Henry B. Whitaker, same place.

447,894 Electric light signal; Walter R. McCann and Simon S. Creider, Sterling, Ill.

447,896 Insulation of electric conductors. 447,897 Electric conductor; Frederick J. Nash, Brooklyn, N. Y.

447,906 Electric railway signal; Wm. W. Rosenfield, New York, N. Y., assignor to the American Electric Railway Signal Co., Jersey City, N. J.

447,918 Automatic telephone exchange; Almon B. Strowger, Kansas City, Mo.

447,920 Method of operating arc lamps. 447,921 Alternating electric current generator; Nikola Tesla, New York, N. Y.

447,939 Electric motor; William H. Chapman, Portland, Me., assignor to the Giant Electric Motor Co., same place.

447,943 Railway car telegraphy; Wm. S. Cook and Moses C. Cook, South Omaha, Neb.

447,998 Electric alarm; Geo. W. Adams, Boston, Mass.

448,024 Telephone toll apparatus; Wm. Gray, Hartford, Conn., assignor of one-half to Chas. Soby, same place.

448,031 Electric railway signaling apparatus; Eugene L. Harrison, Crookston, Minn.

448,040 Commutator; William Hornberger, Elkhart, Ind.

448,084 Electrode for arc lamps; Albert C. Seibold, Mount Vernon, N. Y.

448,107 Electric arc lamp; La Motte C. Atwood, St. Louis, Mo., assignor to the Atwood Electric Co., same place.

448,110 Electric door opener; Louis Bates, Jersey City, N. J.

448,125 Train order annunciator; Leonard T. Crabtree, Oconto, assignor of one-half to Gilbert Milligan Knapp and Dayn Eldridge Wescott, both of Shawano, Wis.

448,128 Body battery and attachments for the same; John A. Crisp and Geo. F. Webb, Jefferson, Ohio.

448,153 Apparatus for intensifying electrical undulations; John C. Ludwig, San Francisco, Cal., assignor of seven-eighths to Henry T. Compton, Louis F. Monteagle, Timothy Paige and Geo. H. Roe, same place; Allen T. Ayres and William C. Mason, Oakland, Cal., and Hiram J. Ayres, Akron, Ohio.

448,164 Device for raising or lowering incandescent electric lamps; Chas. F. Reinmann, Brooklyn, N. Y.

448,166 Automatic switchboard and safety cut-out for electric circuits; Edgar A. Sweet, Milford, Mass., assignor of one-half to Joseph L. Buxton, same place.

448,167 Switch for incandescent lamp sockets; Alfred T. Tregurtha, Everett, assignor of one-half to John A. Murray, Boston, Mass.

448,169 Polarized annunciator; Ernest P. Warner, Chicago, Ill.

448,172 448,173 Trolley for electric railways; Merle J. Wightman, Scranton, Pa., assignor to the Wightman Electric Manufacturing Co., same place.

WHOEVER has old Storage Batteries, Zincs, Battery Copper, Scrap Copper Wire, old Hard Rubber, Etc., to sell, should write to
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